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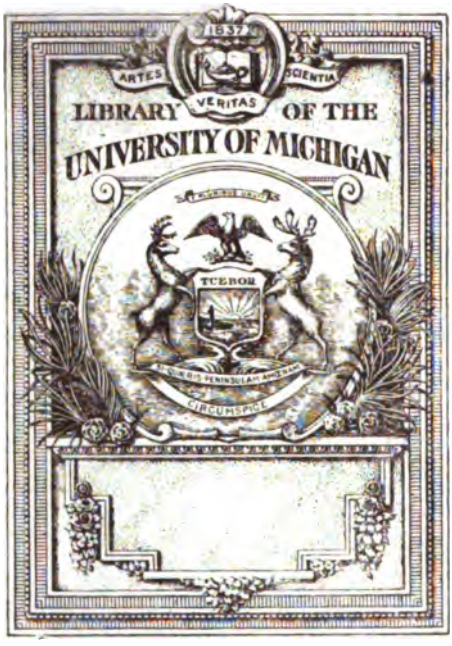
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THE

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(Assisted by several Scientific Gentlemen.)

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No. CXL.

Recent Patents.

To JOHN GRANTHAM, *of Liverpool, in the county of Lancaster, engineer, for certain improvements in the constructions and arrangements of the engines and their appendages for propelling vessels on water.*—[Sealed 8th December, 1842.]

THIS invention relates to the arrangements employed for propelling vessels, by the application of the reciprocating engine to work any screw, spiral, or other propeller, placed in the stern or run of the vessel. The shafts of each propeller are at present driven by the intervention and employment of spur-wheels, friction-wheels, or straps and pullies, or other similar machinery, whereby the motion of the piston of the steam-engine is applied to move such propeller with a suitable velocity.

The patentee's improvements consist in dispensing with such machinery, and simplifying the constructions and arrangements of the engines and their appendages for propelling vessels, by placing the crank-shaft of the reciprocating engine and the shaft of the propeller on the same axis; or, in other words, making one common shaft serve both purposes, so that the piston-rod of the engine may communicate motion directly to the shaft of the propeller.

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The advantages to be derived from dispensing with the above-mentioned machinery and apparatus, by reason of the less number of parts, and the saving in weight and room, are obvious, and will be found of peculiar value in those cases in which the propeller is used as auxiliary to sails, as well as when used in vessels propelled almost entirely by steam.

In Plate I., fig. 1, represents front and side views of an engine intended to be applied to such vessels as have a considerable depth of hold, such as ships of war, and other sea-going vessels. The cylinders *a*, *a*, are made to oscillate in the manner now very generally used, and are placed in a diagonal position, so that both piston-rods are attached to the same crank *b*. These cylinders are supported in the usual way, upon pedestals *c*, *c*, which may stand on a foundation-plate *d*; and to this plate is also attached the condenser at *e*. The crank *b*, is attached to a shaft *f*, and causes it to revolve; this shaft *f*, is supported on frames *g*, *g*, which stand on the foundation-plate *d*, and is continued from the engine along the centre of the vessel through a stuffing-box at the stern, to allow of the screw or other propeller being keyed thereon. The air-pump or pumps may be worked by a counter-shaft *h*, having a crank, from which a connecting-rod *i*, leads to a small working-beam *k*, to the ends of which beam the pump-rods are attached, as seen by dots in the end view.

Fig. 2, represents another arrangement, which may be advantageously employed in shallow vessels. It is on a somewhat similar construction to the last, excepting that the position of the cylinders and shaft are reversed, to allow of the latter being placed nearer the bottom of the vessel than can be accomplished by the plan represented at fig. 1. This arrangement will need no further description, as the principles in both are exactly similar.

Fig. 3, is an arrangement which, like fig. 2, is peculiarly applicable to shallow vessels. The cylinders *a*, *a*, are placed vertically over the shaft *f*, and are attached to separate cranks *b*, *b*, having an intermediate shaft, as in marine engines with paddle-wheels. On this intermediate shaft there is a crank, for giving motion to the air-pump or pumps *l*, by means of a connecting-rod and beam *k*, as in plans 1, and 2.

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Fig. 4, shews another arrangement, somewhat similar to fig. 3, but adapted to deep vessels. In this arrangement, the cylinder is placed immediately beneath the propeller-shaft, instead of above, as in fig. 3.

Fig. 5, is another arrangement; the engine being constructed on the oscillating principle, and may be employed for shallow vessels. In this figure, the cylinders are placed horizontally, and have an intermediate shaft, as in figs. 3, and 4. The other parts are the same as in the preceding figures.

The five arrangements above alluded to, and shewn at figs. 1, 2, 3, 4, and 5, are, as before mentioned, all constructed on the oscillating principle, which, from its compactness is, for most purposes, preferred to the stationary cylinder. The patentee next proceeds to describe the manner in which he arranges the parts, and applies the power of engines constructed on the stationary cylinder principle.

Fig. 6, is one of the methods of applying the power derived from the piston-rod of a stationary cylinder direct to the shaft of the stern-propeller. In this figure, the cylinders *a*, *a*, are placed above the shaft *f*, and the air-pumps *l*, and condensers *e*, are placed beside it. This arrangement is, like figs. 2, and 3, intended to be employed for shallow vessels; and it may be here remarked, that when the propeller-shaft *f*, is situated above or higher in the vessel than the cylinders, whether oscillating or stationary, this arrangement is more peculiarly applicable to vessels having considerable depth of hold, as in ships of war, or large merchant vessels; but when the propeller-shaft *f*, is below the level of the cylinders, whether stationary or otherwise, then the arrangement is more particularly intended for shallow vessels.

Fig. 7, represents another arrangement, in which the cylinders are stationary, but mounted in an oblique direction. The connecting-rods of both these cylinders are attached to the same crank, thereby obviating the necessity of having an intermediate shaft.

Fig. 8, represents a method of working the propeller-shaft by means of a connecting-rod, attached to a vibrating beam of a small engine, as shewn by dots at *o*; in this instance the propeller-shaft is above. Fig. 9, represents another method

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of working it from the beam; the shaft being placed below, and the beam *o*, above.

Fig. 10, represents another construction, in which the propeller-shaft is worked from the beam of a small ordinary marine engine, which is placed across the vessel. The cylinder acts upon one end of the beam, (which is mounted in bearings at its centre,) and a rod, at the opposite end of the beam, is connected to the crank of the propeller-shaft *f*, above, and causes it to revolve.

Fig. 11, is an arrangement constructed on a similar plan to engines usually employed on land for stationary purposes. In this figure the propeller-shaft is placed below, and the beam above the level of the cylinder; this arrangement being intended for a different kind of vessel to that shewn in fig. 10.

Figs. 12, and 13, represent front and side views of two other arrangements of engines, known among engineers as the grasshopper and steeple engines. The arrangement shewn at fig. 14, is somewhat similar to that represented at fig. 6, except that the piston-rods work out of the top of the cylinders, and the power is transferred to the propeller-shaft by means of connecting-rods and cross-heads. Although two cylinders are described, and shewn in the drawings, as being employed, yet it is perfectly evident that, if required, one only, or more than two, may be used.

The patentee claims the application of the power of the reciprocating engine to drive the propeller-shaft directly, as above described; and also the several arrangements whereby the invention is carried into effect, as hereinbefore set forth.—[*Inrolled in the Rolls Chapel Office, June,* 1843.]

Specification drawn by Messrs. Newton and Son.

To James Morris, *of Cateaton-street, in the City of London, merchant, for improvements in locomotive and other steam-engines.*—[Sealed 22nd December, 1842.]

This invention relates to the apparatus for working and regulating the slide valves of locomotive and other steam-engines, where it is desired to use steam expansively; and

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consists in rendering the same suitable for cutting off the steam at any portion of the stroke.

In Plate II., fig. 1, is a longitudinal section, and fig. 2, a sectional plan of the cylinders and slide valves of a locomotive engine, with these improvements applied thereto. *a*, is the slide valve, which receives motion, as usual, through the rod *b*, and lever *c*, connected by a rod with one of the excentrics on the driving axle; *d*, *e*, are the passages in the slide valve for the admission of steam into the cylinder. *f*, *f*, are two slide valves, which are separate from each other, and press at their lower surfaces upon the upper face of the valve *a*. On the upper part of each of the valves *f*, is a bridge-piece, which is cut with a female screw, (the bridge-piece of one valve having a right-handed, and the other a left-handed screw) and through these a shaft *g*, passes, cut with threads to correspond with those in the bridge-pieces. The shaft *g*, is connected by the rods *h*, and socket-piece *i*, with the lever *j*, mounted upon the shaft *k*; and upon this shaft is also mounted a lever *l*, (as shewn in the detached views, fig. 3,) in a slot at the end of which a metal box or socket *m*, on the cross-head *n*, slides freely; by this means motion is communicated to the valves *f*. The front end of the shaft *g*, slides freely in the direction of its length, in a circular boss *o*, (which carries a bevil pinion *p*, and is supported in a bearing *q*,) but is prevented from turning therein by a projection or feather edge, which enters a groove in the shaft *g*; or, instead of employing this projection, the end of the shaft may be made square, and the interior of the boss shaped into a corresponding form. The shaft *g*, with the boss *o*, is caused to revolve (in order, by means of the screws upon it, to move the valves *f*, nearer to, or farther from each other) by the bevil pinion *r*, on the shaft *s*, taking into the pinion *p*, on the boss; the shaft *s*, receiving motion through the pinions *w*, *x*, from the shaft *y*, which is turned by a handle at the hind end of the engine.

The action of the various parts is as follows, reference being had to fig. 1:—In this figure, the piston is shewn at the front end of the cylinder, and is about to move backwards; the valve *a*, is in the middle of its course, and is moving in the direction indicated by the arrow; while the valves *f*, may be considered to be at the end of their course, and are about

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moving in an opposite direction to the piston; it should also be remarked, that at this time the valve *a*, is working at its greatest rate of speed, and the valves *f*, at their lowest. The valve *a*, moves in the direction indicated, and the steam enters at the right-hand end of the cylinder; but by the simultaneous movement of the two valves *f*, the passage into that end of the cylinder will be quickly closed, and the piston will be forced on by the expansive force of the steam. When the piston has arrived at about the middle of the cylinder, the valve *a*, will have arrived at the end of its course, and the opening *e*, will be quite closed, (as it was supposed to be before the valves *f*, would have acquired their greatest speed, and the valve *a*, would begin to move in the same direction, but at its lowest speed) and the valves will have to return to the position shewn at fig. 1, before the opening *e*, will again be in a position to admit steam into the cylinder. When the piston has arrived at the left-hand end of the cylinder, the opening *d*, will be in a position to admit steam in front of the piston, and similar results will be produced to those which have been described with respect to the supply of steam to the right-hand end of the cylinder. The steam may be cut off at any part of the stroke, by varying the distance between the valves *f*, in the manner before described; and an indicator may be placed within sight of the engineer, in order to shew the position of these valves, and consequently the power at which the engine is working.

Fig. 4, represents another arrangement, somewhat similar to the above. In this instance, two valves *a*, are employed, and the chest in which they work is divided into two parts, by a partition *t*; the rods of these valves carry two cross-pieces, connected by rods at the outside of the valve chest, for the purpose of causing the valves to move together. The valves *f*, move in a separate chest or case, above the valves *a*, and in the bottom of this chest are the openings *u*, *v*, through which the steam passes.

The patentee claims the mode of working and varying the distance between the valves *f*, when working in combination with a suitable valve or valves *a*, during the working of the engines, as above described.—[*Inrolled in the Rolls Chapel Office, June*, 1843.]

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To JULIAN EDWARD DISBROWE RODGERS, *of Upper Ebury-street, in the county of Middlesex, chemist, for certain improvements in the separation of sulphur from various mineral substances.*—[Sealed 12th January, 1843.]

THIS invention of improvements in the separation of sulphur from mineral substances, is founded upon the affinity of hydrogen for sulphur, and oxygen for certain metals. The improvements consist in conveying steam through the furnace or retort, during the operation of washing or calcining mineral sulphurets, previously reduced to coarse powder; the hydrogen of the water, or a certain portion thereof, combining with the sulphur of the ore, and forming sulphuretted hydrogen; and the oxygen, previously in union with hydrogen, combining with the metal, and forming an oxide of the same metal.

In Plate II., is shewn that form of apparatus best adapted to the circumstances affecting the reduction of various kinds of ores, and such as in all cases will admit of the utmost possible action of the steam upon the ore, during the time it is undergoing the process of calcination or roasting.

When the object is to save the sulphur, vessels or retorts admitting the passage of the steam through them, so as to produce direct action upon the ore, should be used; but they must be heated by fire from beneath, as shewn in the drawing, which represents a longitudinal section of a retort A, into which the steam is admitted through the pipe B, and the vapours pass out through the pipe D. The retort may be charged or emptied by means of the door C, by which aperture the ore may also be stirred with a rake, or other instrument, commonly used for that purpose. But where the object is merely to expel the sulphur, for the purpose of obtaining the metal with which it is combined, as in the reduction of silver, copper, and other ores, the steam may be conveyed through the usual calcining furnace; the reverberatory form being preferred.

The separation of the sulphur is more readily effected if the ore be occasionally stirred, as a fresh surface is exposed to the action of the steam. In the common method of calcination,

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a sub-sulphate is formed, which precludes the expulsion of the whole of the sulphur; but, in the present process, the patentee states that he has succeeded in completely separating the sulphur from the sulphurets employed; and when operating upon iron pyrites from Cornwall, he has obtained from it a perfectly pure oxide of iron.

As regards the collection of the sulphur, a certain portion is usually simply expelled, and may therefore be condensed in a chamber; that sulphur, however, which is separated, in combination with hydrogen, may advantageously be treated in two ways:—1st, It may be at once burnt, or it may be collected in a suitable gasometer, and then burnt; the sulphurous acid, thus obtained, being converted into sulphuric acid by any of the existing processes. 2nd, The gas may be burnt in a limited portion of atmospheric air; the hydrogen, under these conditions alone, enters into combination with oxygen, while the sulphur is separated, and condenses in a pure state.

The patentee claims the direct application of the protoxide of hydrogen or water, which he prefers using in the form of steam, in the calcination or roasting of the ores of silver, copper, iron, zinc, and all other metals or mineral substances, with which sulphur is combined, for the more complete separation of the sulphur from these metals or mineral substances; and the sulphurous vapours thereby obtained, may be treated in any manner that may be considered most desirable. —[*Inrolled in the Petty Bag Office, July*, 1843.]

Specification drawn by Messrs. Newton and Son.

To Isham Baggs, *of King's-square, in the county of Middlesex, chemist, for improvements in obtaining motive power, by means of carbonic acid, and also by a peculiar application of heated air.**—[Sealed 9th February, 1842.]

This invention of improvements in obtaining motive power

* By a memorandum of alteration, filed with the Clerk of the Patents, August 9th, 1842, the words, "and also by a peculiar application of heated air," are struck out from the title.

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by means of carbonic acid, consists in so constructing machinery and apparatus, that suitable chemical matters may be employed to evolve carbonic acid gas, the pressure of which, acting against a piston in the cylinder of a suitable engine, produces motive power; and the carbonic acid gas, having been thus employed, is allowed to pass from the cylinder into a vessel containing suitable chemical matters, to absorb or take up the carbonic acid, and thus, for a time, destroy the force it previously possessed.

The figure in Plate III., represents a section of the apparatus used for evolving carbonic acid in the form of gas, and for again absorbing that gas, when it has been used for moving a piston in a suitable engine or cylinder. *a*, is the generator, into which the chemical matters, employed for generating carbonic acid, and evolving it in the form of gas, are introduced; they consist of super-sulphate of ammonia and carbonate of ammonia, which are respectively contained in the two vessels *b*, and *c*, and these matters are constantly forced into the generator by the pumps *d*, and *e*. There are cocks to regulate the supply of the two materials, in order that they may be admitted into the vessel *a*, in proper quantities, in relation to each other, so as to evolve the whole of the carbonic acid contained in the carbonate of ammonia; and this will readily be judged of by having a pressure-guage and safety-valve to indicate the pressure, and the pumps are to be driven by any suitable machinery from the engine. The gas evolved from the combination of the two liquors in the vessel *a*, will pass off by the pipe *f*, to the cylinder of the engine. The pipe *f*, in passing to the engine, is conducted to the vessel *g*, and coiled therein, as shewn in the drawing. The object of this arrangement is, that as the gas passing through the pipe will be at a very low temperature, it will take up the heat in the vessel *g*, generated by the coming in of carbonic acid from the eduction way of the engine; such carbonic acid being conducted from the eduction way into the vessel *g*, by means of the pipe *h*, which dips into the liquor in the vessel *g*. This liquor is a solution of ammonia, which, quickly taking up the carbonic acid, reduces the pressure thereof on the eduction side of the piston; it is also desirable to keep

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down the temperature of the liquor in the vessel *g*, by passing the pipe containing the cold carbonic acid through that vessel, as above explained; because on the one hand the expansive force of the carbonic acid gas, passing to the engine, is thereby enhanced, whilst the liquor, contained in the vessel *g*, is prevented volatilizing; but in order to ensure the complete taking up of the returned carbonic acid, there is a vessel *i*, containing also a solution of ammonia, connected by the pipe *j*, to the vessel *g*, into which any gas not absorbed will pass, and be there taken up; and in case of too much pressure, there is placed the pipe *k*, rising to a considerable height, so as to prevent the pressure injuring the vessels *g*, and *i*; or safety-valves may be used. In the progress of working, the liquors contained in the vessels *g*, and *i*, will be converted into carbonate of ammonia, which must, from time to time, be drawn into the vessel *c*, by the pipes *l*, and a fresh supply of the solution of ammonia must be then given, in order to take up the carbonic acid as it comes from the eduction way of the engine; this is supplied by a pipe *m*, connected with the vessel *n*, into which the solution of ammonia is received from the still or retort *o*.

The sulphate of ammonia, which is from time to time withdrawn from the generator *a*, (the formation of sulphate of ammonia in the generator being the consequence of the evolution of carbonic acid gas from the mixture of the super-sulphate of ammonia and the carbonate of ammonia,) is conveyed to the vessel *p*, and from thence to the retort *o*, from which, by the application of heat, a portion of the ammonia is driven off in the shape of vapour; this vapour is absorbed by the water contained in the vessel *n*, and the remaining matter in the still, being the super-sulphate of ammonia, may be drawn off into the vessel *b*. It may be here remarked, that the operations of obtaining the super-sulphate of ammonia and ammonia from the sulphate of ammonia, need not proceed simultaneously with the working of the other parts of the apparatus; for when the vessels *b*, and *c*, and the vessel for receiving the sulphate of ammonia, are sufficiently large, the engine may be worked for a considerable period without the recovery of the ingredients by the still; that process

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being applied at any convenient period. It will thus be seen, that the matters are used again and again in generating carbonic acid in the form of gas, and using it as a means of moving the piston of a suitably constructed engine; which gas is then absorbed or taken up, so as to remove the pressure of the gas from the eduction side of the piston.

The patentee states, that he is aware carbonic acid has before been attempted to be used as a means of obtaining power, but in such case it was acted on by heat, to expand, and cold, to contract its bulk; he does not, therefore, claim the use of carbonic acid generally, as a means of producing power; neither does he claim any novelty in evolving carbonic acid gas, by combining super-sulphate of ammonia and carbonate of ammonia, when separately considered; nor the absorbing of carbonic acid by means of a solution of ammonia; nor the obtaining of ammonia by submitting sulphate of ammonia to heat, when separately considered; but he claims, as his invention, combining those three processes with a suitable engine, so that the power of the evolved gas may be exerted on the piston of such engine, before the gas is absorbed or taken up; he also states, that he does not confine himself to the precise means herein described, so long as the peculiar mode of working, above shewn, be retained, whereby carbonic acid, in the form of gas, is evolved and used as a means of pressure to obtain motive power, and then absorbed, and the matters used for evolving and absorbing the gas are used over and over again, as above described.—[*Inrolled in the Inrolment Office, August*, 1842.]

To John Oliver York, *of Upper Coleshill-street, Eaton-square, in the County of Middlesex, engineer, for improvements in the manufacture of axles for railway-wheels.*—[Sealed 8th October, 1842.]

The first part of this invention relates to a mode of making hollow axles for locomotive and railway carriages, when employing one or two pieces or plates of iron, dished or sunk into a tube or cylinder, as shewn in Plate II., at fig. 2, or

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into plates of a hollow or semi-circular section, as shewn at fig. 3, which plates are welded together in the manner described in the specification of a former patent, granted to the patentee; but in place of applying pieces or hoops at the ends to form the necks, as is there shewn, the ends of the pipe or tube (made by the one or the two bent plates) are now forged into necks without such additional parts, by which means much labor is saved, and very strong axles, for locomotive and railway carriages, are produced. Fig. 1, shews an axle, partly in section, made according to this part of the invention.

The second part of the invention has for its object another mode of making hollow axles for locomotive and railway carriages, and consists in welding together three or more bent plates of iron into a tube or cylinder, as shewn at fig. 4; these plates of metal, being bent into the proper form, are bound, at intervals, with wire or hoops, so as to hold them together, and are then heated to a welding heat, and passed between grooved rollers, in order to weld the parts together.

The patentee here remarks, that the hollow through the axle, when it is composed of three or four bent plates, welded together, is not to be less than one-half of the diameter; as he has found, that when making hollow axles of three or four pieces welded into a cylinder or tube, it is not advisable to subject them to more hammering than can possibly be avoided, either in welding the parts into a cylinder, or in forming the necks at the ends thereof; and he also prefers that the necks should be hollow, which could not be the case if the original diameter of the cylinder or tube produced had the metal of greater thickness than one-half of the diameter of the hollow. This part of the invention is strictly confined (when making hollow axles of three or more pieces welded into a cylinder or tube) to the forming of such cylinder or tube with the hollow part thereof at least half, or more than half the whole diameter of the axle. The necks of these axles are preferred to be forged by means of the machine hereafter explained, though they may be forged by other means. Fig. 1, also represents an axle, manufactured according to the second part of the invention.

The third part of this invention consists in making axles

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for locomotive and other railway carriages. Fig. 5, shews a partly-finished axle in section, made according to this improvement; one end of the axle being finished, and the other end of the axle shewing the means of making the same. *a*, is the outer tube or cylinder of iron, made in any suitable manner, and *b*, is an inner tube, introduced at each end of the tube *a*, so as to give strength at the ends, and allow of the remainder of the axle being made of thinner metal; one end of the tube *a*, is to be heated, and pressed on to the inner tube *b*, and the two are to be raised to a welding heat, and the neck at that end forged, either by the machine, hereafter described, or otherwise; the ends of this axle, and also the others, being closed by hammering, when the iron is at a welding heat.

The fourth part of the invention relates to a mode of so forming and fixing axles of locomotive and other railway carriages, that in the event of their breaking near the nave of the wheel, (which, in the larger number of cases, is the place where axles break,) the wheel shall remain fast to the axle. Figs. 6, and 7, shew the ends of two axles, somewhat differing in shape, but constructed on the same principle; the shape of the part beyond the nave of the wheel may be varied, so long as the part affixed to the nave is suitable for holding the axle, in the event of its breaking. *c*, is a ring, in two pieces, which embraces the axle, but not so closely as to form part of the bearing; the object being, that the point of bearing at *d*, *d*, of the nave of the wheel, should not be varied, and that the break may take place there, so that the part *c*, would then retain the broken end, and the wheel would not come off.

The fifth improvement has for its object a mode of using axles with or without necks, where an inside or an outside bearing is employed. Fig. 8, shews a section of an axle, and also of the nave of a wheel, in which it is fixed; and it will be seen, that the inside bearing is formed with, or affixed on the tube *e*, which is keyed in the nave of the wheel, and the inner end of the tube is made bell-mouthed, and the axle *f*, is keyed or affixed in the tube *e*; by this arrangement there will be less liability of the axle breaking near the inside of

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the nave of the wheel than heretofore. Fig. 9, shews a similar axle, with an outside neck, similarly constructed to that at fig. 8.

The sixth improvement consists of a machine or press for forging the necks of hollow axles, by means of dies. Fig. 10, is a vertical section of the machine; *g*, *g*, are four standards or guides, for guiding the upper and lower die; these standards are affixed to the plate *h*, and to the upper plate *i*. The plate *h*, is supported by four pillars *j*; the plates *h*, and *k*, being fixed together by screw-bolts passing through the pillars, or by any other convenient means. *l*, is the upper, and *m*, the lower die, each carried by a suitable frame, as is shewn. The upper die is worked up and down by means of a crank *n*, on a revolving shaft; the frame of the upper die is connected with the crank by a connecting rod. The lower part of the frame of the lower die slides through the plate *h*; there being a female screw formed or fixed in the interior of the lower part of the frame, in which the male screw *o*, works, and raises the lower die, as the size of the axle is reduced by the pressure of the upper die. *p*, is a wheel, affixed on the end of the screw *o*, to work the same. The dies may have one or two shapes formed therein, suitable for forming a neck on a hollow axle; the drawing shews the dies to have two hollows, each suitable for receiving between them and compressing a hollow axle, so as to form a neck,—the axle being turned as the dies are separated. The mode of opening and closing the dies may be varied.

The seventh improvement relates to a mode of constructing the cranked axles of locomotive railway carriages, and consists in welding several plates or sheets of iron or steel together, which have been previously bent or cast into the cranked form. Fig. 11, shews a perspective view of part of a cranked axle, before the parts are welded and forged together. Fig. 12, shews a section of the straight part of the axle, when it is to be solid; and fig. 13, a section of the plates or bars, when the axle is to be hollow. Each plate or bar, of which the axle is to be composed, is to be first cranked, so that the grain or fibre of the iron may run in the direction indicated by the arrows and lines, and then the whole is to be welded and forged into an axle.

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The eighth improvement has for its object another mode of constructing hollow axles for locomotive and other railway carriages, and consists in affixing the neck into the end of a hollow cylinder, as shewn at fig. 14. Each end of the hollow axle is made conical, and the stem of the neck is made conical to fit therein. *q*, is a key or cotter, passed through the axis and the stem of the neck, and as the cotter or key, and the hole through which it passes, come within the nave of the wheel, and the nave projects considerably beyond the key or cotter, on either side, the axis will not be injuriously weakened by this mode of fixing, whilst the arrangement offers a convenient means of changing the necks, and of using steel necks with iron axles. This part of the invention is also applicable to solid axles, with a slight alteration in the detail.

The ninth improvement consists in making hollow axles for locomotive and other railway carriages, by applying cast-steel for such purposes; this is effected by casting a hollow tube or cylinder, about four or five feet long, and four to five inches diameter; the thickness of metal being about one inch to one inch and a quarter, according to the size of the axle required; it is then, when in a heated state, rolled or forged into the proper length for an axle, and the necks are produced by compressing the ends of the axle, by means of the machine herein described, or in any other convenient way.

The patentee claims, Firstly,—the making of locomotive and railway carriage axles, each of two hollow plates, welded into a tube, and the necks forged thereon, without adding thickening pieces, as above explained. Secondly,—the mode of constructing hollow axles for locomotive and other railway carriages, when using three or more pieces, by causing the hollow to be of at least half the diameter of the axle. Thirdly,—the method of making hollow axles for locomotive and other railway carriages, by strengthening the ends with tubular pieces *b*, as above described. Fourthly,—the mode of constructing solid or hollow axles, in combination with the part *c*, as described in respect to figs. 6, and 7. Fifthly,—the mode of constructing solid and hollow axles, and affixing them to wheels, as described in respect to figs. 8, and 9. Sixthly,—combining dies for forging or pressing necks at the ends of

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hollow axles, as above described. Seventhly,—the mode of making cranked axles for locomotive railway-engines, as above described. Eighthly,—the mode of making hollow or solid axles, with moveable necks, as above described; and Ninthly, —the mode of manufacturing hollow axles for locomotive and other railway carriages, by applying cast steel.—[*Inrolled in the Inrolment Office, April,* 1843.]

To CHARLES COWAN, *of Penicuick, in the County of Edinburgh, paper manufacturer, and* ADAM RAMAGE, *of Valley Field, in the same county, paper-maker, for improvements in machinery used in the manufacture of paper.*—[Sealed 3rd January, 1840.*]

THE machinery to which this invention relates is the rag-engine; and the improvement consists in substituting a cylindrical sieve or strainer, of a peculiar construction, for the ordinary strainers, by which the dirty water is separated from the pulp. The periphery of the cylindrical strainer is formed of wire gauze, or other suitable material, and its interior is divided by any suitable number of curved partitions, which form a series of scoops or buckets. The strainer is closed at its ends by plates of sheet metal or other material, and its axle passes through one of these plates, and is secured to the other by arms in a hollow centre-piece, attached to that plate. The axle of the strainer is mounted in a bearing on the side of the cistern of the engine, and the hollow centre-piece, which forms a continuation of the axle, is mounted in a bearing upon the central partition of the engine. Upon that part of the axle which is enclosed by the strainer, a cone of wood or metal is formed, its apex entering into the hollow centre-piece, above mentioned, for the purpose of directing the water to that side of the strainer, from whence it is raised by the scoops or buckets.

* By a memorandum of alteration, filed with the Clerk of the Patents, July 2nd, 1840, the title of this patent stands, "for an improvement in machinery used in the manufacture of paper."

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Rotary motion is communicated to the strainer by gearing from the beater-shaft; and as it revolves, the dirty water, entering through the wire gauze, is elevated above the centre of the strainer, by the scoops, and, flowing through the hollow centre-piece into a trough, is carried away. As the dirty water is carried off, clean water is introduced into the cistern, in the usual manner.

The patentees do not claim the exclusive right of using a hollow revolving cylinder or drum, for the purpose of withdrawing water from a paper-engine, (the same having been patented by Mr. John Hall, in 1831, see Vol. XI., page 40, of our present Series,) but confine their claim to "adding or applying to, and combining within the interior of such drum, scoops or buckets, as hereinbefore described, for the purpose of elevating the water, which has entered into it through its wire circumference, so that the water, when elevated, may be able to run, by its own gravity, out of the hollow around the central axis of the drum, into any suitable shoot or trough, in order to make its escape at a level above the surface of the water and rags or material contained in the paper-machine."—[*Inrolled in the Inrolment Office, July*, 1840.]

To HENRY MARTIN, *of Norton-terrace, Camden-town, in the County of Middlesex, painter, for improvements in preparing surfaces of paper.*—[Sealed 30th March, 1840.]

THIS invention consists in embossing and enamelling the surfaces of paper, and in manufacturing paper-hangings. A coat of oil-paint, of the desired color, is first applied to the surface of the paper, as evenly as possible, with a common paint-brush; it is then rubbed lightly over with a brush, similar to a clothes or shoe-brush, (giving it a circular motion,) to remove the marks of the paint-brush; after which, an additional smoothness is given to the painted surface, by passing a dry brush, called a "a softener," lightly over it. If more than one coat of paint be laid on, this process is repeated. Or, instead of the above method, the paint may be applied

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by conducting the paper between two rollers, together with an endless felt or other fabric, which is supplied with paint by passing under a roller, partly immersed in it; the superfluous paint being removed from the felt, as it ascends, by a scraper. The paper, thus prepared, is embossed, by passing it between engraved rollers or dies; or is converted into paper-hangings, by printing the required designs upon it with blocks or other surfaces. If a glazed or enamelled surface is to be given to the paper, the oil-paint must be used in a thick or round state, and thinned only with turpentine, in the same manner as if it were used for "flatting." When the turpentine evaporates, the color becomes set; the paper is then placed upon a bed of woollen cloth or other soft material, and a pallet-knife or trowel, with a polished surface, is passed over the painted surface of the paper, with a slight pressure; the color being set, yields to the pressure, and a glaze is thereby produced, which may be afterwards heightened in the usual manner. Other means may be resorted to for glazing the painted surface of the paper, if preferred.

The patentee claims, Firstly,—the mode of preparing surfaces of paper, by combining thereon a coating of oil-paint with subsequent embossing. Secondly,—the mode of preparing surfaces of paper, in the manufacture of paper-hangings, by combining thereon a coating of oil-paint, and afterwards printing or producing the required pattern thereon. Thirdly,—the mode of preparing surfaces of paper, by obtaining thereon a coating of oil-paint, and subsequently glazing or planishing the same. Fourthly,—the mode of producing a coating of oil-paint on paper, by means of rollers. —[*Inrolled in the Inrolment Office, September,* 1840.]

To Thomas Barratt, *of Somerset, paper-maker, for improvements in the manufacture of paper.*—[Sealed 25th November, 1840.]

The first part of these improvements consists in the application of currents of air to paper, when being dried by cylinders, heated by steam.

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Fig. 1, Plate III., is a transverse section of the apparatus employed for this purpose. *a*, *a*, are the drying cylinders; *b*, an endless felt, beneath the two lower ones; and *c*, is the paper, which comes from the machine in the state of "engine-size or water-leaf," and passes round the cylinders in the direction shewn by the arrows; thence between the rollers *d*, to the reel *e*. The air is directed against the surface of the paper by the branch-pipes *f*, from the two large pipes *g*, which are supplied with air by any suitable blowing apparatus; the pipes *f*, have each a throttle-valve, with an axis projecting outwards, in order to regulate the passage of the air; and the mouths or openings of these pipes are made long and narrow, as shewn at fig. 2, for the purpose of causing the air to act on the paper, in thin extended streams.

The second improvement consists in cooling the surface of paper, by causing currents of air to act upon it as it passes, after being sized, to the steam-drying cylinders. This improvement is shewn at fig. 3, and is only applicable to paper which has been tub-sized, that is, sized after it is made. The paper passes over an open reel *h*, which contains a rotary fan *i*, to which a slow motion is given, for the purpose of slightly fanning the paper; it thence proceeds over the rollers *j*, to the drying-cylinders *a*, and, after leaving them, it is glazed by the rollers *k*; while the paper is passing round the cylinders *a*, and between the rollers *k*, it is subjected to continuous currents of air from the pipe *f*, and *g*, as in the other machine.

The patentee claims, Firstly,—the mode of drying paper, by applying streams of air to the surfaces thereof, as the paper is being dried by steam-cylinders, whether in the state of engine-size or water-leaf, or after sizing. Secondly,—the application of currents of air to the surfaces of paper, after sizing, in order to cool the size, as the paper passes to the steam-drying cylinders.—[*Inrolled in the Inrolment Office, May*, 1841.]

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To JOHN DICKINSON, *of Bedford-row, Holborn, in the county of Middlesex, paper manufacturer, for certain improvements in the manufacture of paper.*—Sealed 23rd December, 1840.]

THIS invention consists in a mode of sizing paper, continuously, in an air-tight vessel, (partially exhausted of air,) by unwinding a scroll of dried paper from a reel, and conducting it through heated size; then, after pressing out the superfluous size, winding the paper on to another reel.

A longitudinal section of the apparatus employed for this purpose, is represented in Plate III. *a*, is the air-tight vessel; *b*, the reel upon which the paper to be sized is wound, from whence it proceeds beneath the guide-roller *c*, and through the heated size, to another guide-roller *d*; it then ascends between the press-rolls *e*, *f*, (by the revolution of which the paper is drawn from the reel *b*,) and is wound upon the reel *g*. A float *h*, is suspended from the cross-bar *i*, of the vessel *a*, for the purpose of diminishing the surface of size exposed to evaporation; and beneath the bottom of the vessel is an enclosed space *j*, into which steam or hot water is introduced, for raising the temperature of the size.—[*Inrolled in the Rolls Chapel Office, June* 1841.]

To SIR JOHN SCOTT LILLIE, *of Chelsea, for certain improvements in roads.*—[Sealed 2nd November, 1842.]

THESE improvements consist in covering the surfaces of roads with rails or fillets of wood or iron, or composed partly of wood and partly of iron, which are placed at such distances from each other as to form grooves in a transverse direction to the line of traffic. They are imbedded in concrete, asphalte, or other cement; or are fastened to planks, which are secured to sleepers, sunk or grouted into the materials composing the substratum of the road.

The patentee prefers to make the rails or fillets two inches in breadth, if of wood, and one inch only, if composed of iron,

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and to place them at a distance of about one inch apart; but he does not confine himself to these measurements.—[*Inrolled in the Inrolment Office, May,* 1843.]

To FRANCIS GYBBON SPILSBURY, *of Walsall, Staffordshire, chemist;* MARIE FRANÇOISE CATHERINE DOETZER CORBAUX, *of Upper Norton-street, in the County of Middlesex, artist; and* ALEXANDER SAMUEL BYRNE, *of Montague-square, in the County of Middlesex, Gentleman, for improvements in paints or pigments, and vehicles, and in modes of applying paints, pigments, and vehicles.*—[Sealed 7th October, 1839.]

THIS invention consists in using soluble vehicles for applying paints or pigments; which vehicles, by an after application of chemical agents or re-agents, are rendered insoluble in water, and thus allow of paints or pigments, so applied and so fixed, being afterwards washed with water or soap and water, in order to clean them; and this invention will, at the same time, admit of paints or pigments, and vehicles so employed, being applied for the most elegant purposes of house and such like painting, and also to the purposes of the artist, and for printing paper and other fabrics; and, at the same time, they will not emit that disagreeable smell consequent on using oils or spirits, or varnishes, produced therewith, combined with paints or pigments.

In painting, there are few coloring matters or pigments which are used alone, but they are generally employed as coloring substances to what may be called a body pigment; and, in most instances, white lead (carbonate of lead) is used when oils, or spirits, or varnishes, prepared with them, are the vehicles, and the colored pigments are mixed therewith, in order to produce the color or tint of color desired. Hence, in any mode of compounding pigments for the purposes of being applied as paint, it is important to have a good and cheap white pigment, which can be obtained in large quantities; and for such purposes, sulphate of lime, sulphate of

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barytes, argillaceous earths, or other white pigments, (which should be free from iron,) may be used.

It is well known that many chemical agents or re-agents, when brought in contact with gelatine, or with albumen, in solution, coagulate them; and such coagulated substances, when dry, are insoluble. This is the case with other matters, hereafter described, which the patentees employ (as well as gelatine and albumen) as the soluble vehicles for mixing with pigments, in order to their being used as paints; and by the subsequent application of chemical agents or re-agents, such vehicles are rendered insoluble, and the paints or pigments are fixed or set.

When gelatine is used as the soluble vehicle, alum is employed (by preference) as the fixing medium; and, it should be stated, that as most of the paints or pigments will be found to be more or less acted on by the chemical agent or re-agent employed for fixing or rendering the soluble vehicle insoluble, it is important that the pigment (previous to being mixed with the vehicle employed) should be subjected to the action of the chemical agent, which is to be afterwards used in fixing the vehicle or paint. Thus, supposing the pigment intended to used, be an earth, and the chemical agent alum,—then, the earth is submitted to the action of alum, by mixing and washing it with a cold saturated solution of that substance; and subsequently, by repeated washings, to remove the undecomposed alum therefrom; it will then be in a proper state to be ground up with the gelatine and water.

Small pug mills are employed for the purpose of mixing, and if for immediate use, it must be reduced to the proper consistence with soft water, and then laid on to the surface or surfaces, in like manner to ordinary paints, each coat being allowed to dry before another is laid on. When one, two, or more coats, have been applied, according to the desire of the painter, and become dry, the same are to be fixed by applying a cold saturated solution of alum, or such other chemical agent as may have been determined on;—by this means, the paint on the surface will be fixed, and insoluble in water. It is only requisite to remark, that in using colored pigments, they also should be first treated with the alum or chemical agent

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to be employed in fixing the vehicle, as above described, in order to prevent any prejudicial action taking place, in respect to the color and to the pigment itself, which in many instances would be the case, should such pigments be used without preparation, and subsequently brought in contact with the chemical agent used to fix the paint.

Albumen may be used in place of gelatine, or in conjunction therewith; and the use of albumen is recommended for the purposes of the artist, where the cost will not be considered an object; but, for general purposes, gelatine is preferred, in consequence of its being less expensive.

The method of preparing paints or pigments, which are required to be kept for a considerable time, is as follows:— To make white paint, take 160 lbs. of sulphate of lime or sulphate of barytes, or white earth, well washed, in order to separate all foreign matters, as is well understood, and which has been treated with the chemical agent, as above explained; mix therewith about 20 lbs. of solid gelatine and about 14 lbs. of sulphate of zinc (any other suitable material for preserving the gelatine from decomposition may be used,) dissolved in 160 lbs. of warm water. This compound is made into a very thick paste, and packed in small casks; or the compound may be dried with or without sulphate of zinc, or other preservative; or the dry pigment may be prepared or mixed with dry gelatine or albumen.

It should be stated, that the means of preserving gelatine, heretofore most generally adopted,—namely, by the employment of sulphurous acid, acetic acid, and alum, are not proper for the purpose of this invention: those materials which the patentees prefer using, are sulphate of zinc, or other soluble salts of zinc; the soluble salts of magnesia, or the soluble salts of lead.

When the pigment is to be tinted or colored, the white pigment employed is to have colored pigments combined or intimately mixed therewith, in order to produce the tint of color desired; unless the colored pigments are to be employed by themselves, which is seldom the case in coloring or painting; and such colored pigments are to be first treated with a cold saturated solution of alum or other material, which is in-

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tended to be afterwards employed in fixing the soluble vehicle, by rendering it insoluble.

Another part of this invention relates to a like mode of employing other soluble vehicles for pigments, in which the vehicles are to be afterwards rendered insoluble, by alum or other known chemical re-agents; these vehicles are formed by dissolving resinous matters in a solution of borax, or in an alkaline ley, and by dissolving wax in an alkaline ley.

The first kind of vehicle is made by combining well-bleached shell-lac and borax together, in the proportion of about five pounds of the former to one of the latter, and boiling them in about four gallons of water, until dissolved. The pigments are ground with this vehicle to the proper consistency of paint, and are laid on in the usual way; when dry, they are washed over with a solution of alum or other chemical agent which is known to destroy the combination of the lac and borax, and render the lac insoluble.

The second kind of vehicle is produced by mixing equal parts, by weight, of white wax and caustic soda leys, of specific gravity 1.04, and boiling the mixture for several hours, adding half a gallon of water to every pound of wax after the solution is effected. The patentees also prefer to add four pounds of dry starch, calcined or uncalcined, to each pound of wax. To this vehicle is to be added as much of such pigments which, by previous test, are not acted upon prejudicially by an alkaline solution, as will bring it to the consistence of honey, and the mixture is reduced to a proper state for painting, by the addition of soft water. When the surface painted with the mixture or pigment is dry, it is washed over with a solution of alum, or any other chemical agent that will destroy the combination of wax and alkali, leaving the wax insoluble in water. It is obvious that the above vehicles may be used in combination with each other, as well as separately.

Another mode of employing gelatine, and the other vehicles described for fixing paints or pigments, is to apply a coating of either of the vehicles over a painted or printed surface, and afterwards fix the vehicles by a chemical solution, as above described; by this means paints or pigments may be set without the necessity of combining the above-mentioned vehi-

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cles with them, previous to use. In some cases, the sulphate of zinc or other preservative material is mixed with the pigments, as described above, but without any vehicle, which is supplied by the painter previous to using the pigments. The object of this mode is to enable the mixture with gelatine, when made, to keep a reasonable time in hot weather, and at the same time that by their not being mixed till wanted, the pigments may be kept an unlimited time; this mode of preparation is particularly applicable for hot climates.

When the pigments and vehicles, prepared as hereinbefore described, are used for printing and painting paper and other fabrics, as well as other surfaces, a small quantity of dissolved starch should be added to the solution of alum employed as the fixing material, by which means the solution will be caused to work better, and will not be liable to run when laying it on.

The last part of this invention consists in employing certain vegetable matters in the preparations and application of paints or pigments. For this purpose, the glutinous or adhesive products of vegetable matters generally will do, but the patentees prefer gluten, albumen, gums, and mucilage, using them either separate or in combination with other products usually found therewith. For example,—a mixture of flour and water is made in such proportions, that when boiled, it will be about the consistence of cream, and with this mixture the pigment is ground to the state of paint, with or without sulphate of zinc, or other preservative. This paint or pigment, if necessary, is reduced with water, and is then laid on in the usual manner; and when dry, it is fixed by the application of a suitable chemical agent or re-agent, such as silicate of potassa or soda, commonly called liquor of flint.

Another mode of carrying out this part of the invention consists in mixing any quantity of dissolved tragacanth, of the consistence of linseed oil, with as strong a solution of silicate of potassa or soda as will not injure the color which is to be employed. With this mixture the paint or pigment is brought to a proper consistence for working, and then applied in the usual way to surfaces; and when thoroughly dry, it will be insoluble in water.

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The claims made by the patentees are as follow :—Firstly,—the mode of employing paints or pigments and soluble vehicles, (gelatine and albumen) by afterwards rendering such paints or pigments and vehicles insoluble, as above described. Secondly,—(as a new manufacture) the combining pigments with gelatine and albumen, in a dry mass, or in a paste, with suitable materials for preserving the latter from decomposition, in order to allow the paints or pigments, so prepared, being transported from place to place, without detriment to the color, which, when required to be used, is rendered liquid, by hot soft water, when gelatine is employed as the vehicle, and cold soft water when albumen is employed. Thirdly,—(as a new manufacture) the mode of preparing pigments with resinous matters or wax, dissolved in an alkaline ley or solution of borax, made into a thick paste, (or dry,) and thus to allow of the prepared pigments being transported from place to place, and only requiring hot soft water to liquify it for use. Fourthly,—the mode, herein described, of applying pigments, paints, and soluble vehicles, (wax or resinous matter dissolved in an alkaline ley or borax,) by afterwards rendering such paints or pigments, and vehicles, insoluble, as above described. Fifthly,—the mode of combining soluble salts of zinc, magnesia, and lead, with gelatine, in order to preserve the same. Sixthly,—the mode of combining soluble salts of zinc, magnesia, and lead, with pigments, as herein described. Seventhly, the mode, herein described, of preparing and applying paints or pigments, and vegetable products, by rendering such paints or pigments, and vehicles, insoluble, as above described. Eighthly,—the combining pigments with vegetable products, and preserving materials, as above described; and Lastly,—the mode of preparing pigments or paints, and vegetable products, with silicate of potassa, or soda, or other materials having the property of rendering the painted surface insoluble in water, as above described.—[*Inrolled in the Inrolment Office, April*, 1840.]

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To JAMES MALCOLM RYMER, *of Henrietta-street, in the County of Middlesex, civil engineer, for certain improvements in castors for furniture, such improved castors being applicable to other useful purposes.*—[Sealed 23rd April, 1840.]

THIS invention relates to the peculiar kind of castors for which letters patent were granted to E. R. Handcock, October 17th, 1838;* these castors are formed on the principle of a ball and socket, by placing a ball or sphere in a socket or cup; and the present improvements consist, chiefly, in engraving the surface of the sphere, for the purposes hereafter mentioned.

In Plate III., fig. 1, is a vertical section of one of the improved castors. *a*, is the ball or sphere, which is secured in the socket *b*, by screwing on a collar *c*; the surface of the sphere is engraved, and it works against a cap *d*, in the upper part of the socket; so that, when in use, it will revolve easily in any direction, by reason of the friction being greater between its under surface and the floor, than between its upper surface and the cap *d*.

Fig. 2, is a partial section of a castor, which is used without a cap *d*; the sphere working against the upper surface of the socket. Fig. 3, is a partial section of another castor; and, in this case, the sphere works against a ring *e*, placed within the socket. The surface of the sphere may be engraved with any required pattern or design.

The patentee claims the indented, cut, or engraved sphere, of any pattern, fashion, or design, applied to the purpose of a spherical castor, for furniture and other purposes, in any shaped cup or body whatever, constructed for the purpose of holding or partially containing the engraved, cut, or indented sphere. —[*Inrolled in the Inrolment Office, October,* 1840.]

To HENRY PAPE, *of Great Portland-street, in the County of Middlesex, for improvements in castors.*—[Sealed 1st February, 1841.]

THESE improvements in castors consist in the application of

* For specification of this patent see Vol. XIV., page 367, of our present Series.

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two bearing wheels or rollers, instead of the single roller, which has been hitherto employed. In Plate III., will be seen a plan view of a castor, with the improvement attached.

The patentee claims the application of two wheels or rollers to each castor, as above described.—[*Inrolled in the Inrolment Office, August*, 1841.]

To FREDERICK PARKER, *of* 138, *New Gravel-lane, Shadwell, in the County of Middlesex, charcoal manufacturer, for improvements in revivifying or reburning animal charcoal.* —[Sealed 22nd June, 1839.]

IT is well known that in refining sugar much animal charcoal is employed in the process of what is called discoloring the liquors, (sugar dissolved in water,) and that the animal charcoal, so employed, after having been used for some time, requires to undergo a process called "revivifying," which, in fact, is a reburning or recharging; and for performing this operation various arrangements of apparatus have been employed, such as retorts, pots, and ovens, closed as air-tight as possible during the time of applying heat to the same; and the modes or processes of operating with such apparatus, have been, First,—to permit the charcoal to remain to cool down in the same vessel in which it has been heated; this method, though beneficial, as regards the quality of charcoal reproduced, is nevertheless tedious and costly, and it is likewise difficult to keep good joints. Secondly,—the charcoal, under operation, having been heated to the extent required, in closed retorts, pots, or ovens, the charcoal, after opening the apparatus, has been drawn, in the highly heated state, through the atmosphere into coolers or vessels capable of being closed air-tight, or nearly so; which operation materially injures the quality of the charcoal reproduced.

The object of this invention is so to conduct the process of revivifying or reburning animal charcoal, that the retort, oven, or vessel, shall not require to be cooled down, and yet at the same time, the drawing and cooling process shall not cause

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the charcoal to pass into the atmosphere, when in a red-hot condition, or in a state to be injured thereby; hence, according to this process, the vessel, or the part thereof wherein the heating takes place, and the vessel or receiver, or the part thereof wherein the cooling takes place, are so arranged, with respect to each other, that they may be connected, either temporarily or permanently, so as to exclude the air from the charcoal, from the time it enters the heating part of the apparatus, until it leaves the cooling part in such a state as not to be prejudicially acted on by contact with the atmosphere.

In Plate III., fig. 1, represents a section of the apparatus wherein animal charcoal may be revivified, or reburned and cooled, in continued succession, without passing into the atmosphere till sufficiently cooled down. Fig. 2, is a plan in section; and fig. 3, is a transverse section in elevation of the apparatus. *a*, is a vertical retort or vessel of iron, or other suitable material, which is surrounded by the flues of the fireplace or furnace *b*;—*c*, is a hopper or chamber, in which a constant supply of animal charcoal, requiring to undergo the process of reburning, is kept up; hence, as the charcoal is drawn, or permitted to descend from the lower part of the retort or vessel *a*, fresh quantities of animal charcoal will fall or be forced into the upper part of the retort; by this means air will not be allowed to descend to that part of the retort wherein the charcoal is red-hot, or so highly heated as to be prejudiced by contact with the atmosphere. *d*, is the cooling vessel, which is connected to the lower part of the retort *a*, by a sand-joint *e*. The cooler *d*, is made of thin sheet-iron, and of considerable extent, in order to offer sufficient cooling surface; and its lower end is closed by a bottom and slide *f*, in which there are a series of openings; so that when it is desired to draw charcoal, the openings are made coincident.

The charcoal, after descending from the vessel *a*, progressively becomes cooled in the vessel *d*, and by the time it arrives at the point *f*, may be safely withdrawn; and it will be evident that the time allowed for heating in the vessel *a*, and the time allowed for cooling in the vessel *d*, may be controlled by the rate at which the drawing of the charcoal takes place.

The patentee remarks, that it is not absolutely necessary

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to have the bottom or lower end of the cooler *d*, closed as described, as it may be so arranged, that the charcoal which has descended and passed out of the cooler, shall rest in a heap and close the end of the cooler; and the speed of the descending of the charcoal, under operation, will depend on the rate at which the charcoal is removed; indeed, the apparatus may be varied, without departing from the invention, so long as the main object thereof be retained; care being observed, that the animal charcoal be not too early exposed to the action of the atmosphere. *g*, is an apparatus for measuring the charcoal as it comes from the cooler *d*; this apparatus has a slide and perforated bottom, similar to that above described, in reference to the cooler *d*.

The patentee claims the mode of revivifying or reburning animal charcoal, as above described.—[*Inrolled in the Inrolment Office, October*, 1839.]

To JAMES YOUNG, *of Newton-le-Willows, in the County of Lancaster, chemist, for certain improvements in the manufacture of ammonia, and the salts of ammonia; and in apparatus for combining ammonia, carbonic acid, and other gases with liquids.*—[Sealed 11th November, 1841.]

THE improved mode of manufacturing ammonia consists in filling a vertical retort (of the form represented at fig. 1, in Plate II.,) with a mixture of two parts, by weight, of the substance called guano, and one part, by weight, of hydrate of lime or other caustic alkali; these substances are thoroughly mixed, by giving a rotary or reciprocating motion to the agitator *a*, and then the retort is subjected to a moderate degree of heat, which is gradually increased, until the bottom of the retort is red-hot. By this means the ammonia is set free, and the uric acid, contained in the guano, being decomposed, yields ammonia also; but as other gases are liberated besides the ammonia, it is separated from them by passing the whole of the gaseous products through the pipe *b*, into the condenser *c*; a transverse section of which, on the line *f*, *g*, is shewn at fig. 2. The condenser consists of an oblong vessel

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of iron, lead, stone, or other suitable material, the top of which gradually ascends from the entrance to the exit-pipe; it is filled with water, and at the lower end is a bridge *d*, finely perforated, for the purpose of causing the gases to distribute themselves through the water. The ammonia is absorbed by the water, but the other gases, which are insoluble, make their escape through the pipe *e*.

If it be found requisite, the condenser may have one or two inclined shelves within it, with a perforated bridge to each, as shewn at figs. 3, and 4,—fig. 3, being a longitudinal section of the condenser, and fig. 4, a transverse section, on the line *h*, *i*, of fig. 3. The inclined shelves and top of the condenser may be fluted on their under surfaces.

Solutions of carbonate, bicarbonate, or sesquicarbonate of ammonia, are produced, by filling the condenser, above mentioned, with a solution of ammonia, and passing carbonic acid through it.

A solution of sulphate or muriate of ammonia is obtained, by filling the condenser with diluted sulphuric or muriatic acid, and passing the ammonia through it, as it issues from the retort.

The patentee claims, Firstly,—the manufacture of ammonia, by treating the substance called guano and hydrate of lime (or any other caustic alkali) in the manner hereinbefore described, and passing the gaseous products thereof through a condensing apparatus, of one or other of the forms represented in figs. 1, 2, 3, and 4. Secondly,—the manufacture of carbonates (salts) of ammonia, by passing carbonic acid through a solution of ammonia, contained in a condensing apparatus, of one or other of the said forms. Thirdly,—the manufacture of the sulphate or muriate of ammonia, by passing ammonia through sulphuric or muriatic acid, contained in a condensing apparatus, of one or other of the said forms. Fourthly,—the condensing apparatus itself, of each and every one of the forms aforesaid, whether employed for any of the purposes before specified, or employed in any way for combining ammonia, carbonic acid, and other gases with liquids. —[*Inrolled in the Inrolment Office, May*, 1842.]

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To WILLIAM GODFREY KNELLER, *of Wimbledon, chemist, for improvements in the manufacture of soda, in the evaporation of brine, and in the concentration and manufacture of sulphuric acid.*—[Sealed 22nd December, 1842.]

THIS invention relates to the manufacture of soda, the evaporation of brine, and the manufacture and concentration of sulphuric acid; and in carrying out the first and second improvements, the apparatus represented in Plate II., is employed; fig. 1, being a transverse section thereof; and fig. 2, a longitudinal section of parts of the same. It consists of a metal evaporating pan *a*, containing a case *b*, into which high pressure steam is admitted, for the purpose of heating the liquid to be evaporated, instead of applying heat to the under surface of the evaporating pan. The case *b*, contains a number of short vertical tubes, through which the pipes *c*, pass; these pipes *c*, branch from a large pipe *d*, and descending below the steam-case, introduce streams of compressed air into the liquid. The effect of this contrivance is, that the rapid escape of the compressed air, through the pipes *c*, causes a proportionably quick evaporation of the liquid exposed to its action.

In evaporating a solution of caustic soda by this apparatus, the carbonic acid, contained in the compressed air, although small in proportion, becomes great in the large volumes of air continually passed through the liquid; and thus the sulphur, lime, and other impurities, which were held in solution during the caustic state of the soda, become insoluble, and precipitate on its change to the milder state, and are readily separated by means of filtration.

When evaporating brine, the salt, in crystallizing, falls to the bottom of the evaporating pan, and is raked out as usual.

In the manufacture of sulphuric acid, the patentee causes streams of compressed air to act upon the mixture of sulphur and nitre, whilst it is burning in the furnaces connected with the leaden chambers, used in this manufacture, and thereby a more perfect combustion of the same is effected.

When concentrating sulphuric acid, in leaden or earthen

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vessels, compressed air is introduced into the acid mixture, through numerous descending leaden pipes; and, by means of this improvement, the concentration is effected at such a low temperature, that no injurious action can take place upon the containing vessel.

The patentee prefers that the air should pass through wire gauze, or other suitable material, to prevent any dust, or other superfluous matter, from becoming mixed with the sulphuric acid.—[*Inrolled in the Inrolment Office, June,* 1843.]

To John Carr, *of North Shields, in the county of Northumberland, earthenware manufacturer, and* Aaron Ryles, *of the same place, agent, for an improved mode of operating in certain processes for ornamenting glass.*—[Sealed 9th November, 1841.]

This invention consists in improvements in the operations of staining, stopping-out, and obscuring glass.

In the improved method of staining glass, the staining materials, instead of being mixed with oil of turpentine, or other volatile oils, or water, as usual, are mixed with boiled linseed oil, or such other oil as is generally employed when printing with enamel colors on glass; and instead of floating the staining materials over the glass, in a liquid state, they are printed or transferred from metal plates, and, when dry, are fixed by firing, in the usual way. When operating with staining materials, mixed with oil, as aforesaid, on pot metal, or on flashed glass, opaque and transparent shades are produced, leaving the surface of the glass quite smooth, instead of being raised in those parts, as in the common mode of applying body color, for the purpose of shading.

As regards the operation of stopping-out, the materials, used for that purpose, are mixed with boiled oil, and printed on the glass, in the manner above described; the liquid staining composition is then floated over the whole surface, including the parts so stopped out, and the color is fixed by firing. After the glass has been cleaned, the pattern, which

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was printed on it in stopping-out materials, is exhibited in the original color of the glass, and quite distinct from the stained ground; or a printed impression being transferred to the glass, in stopping-out materials, as aforesaid, the remainder of the ground may be obscured in the usual manner; thus producing transparent patterns on obscured grounds.

The improvement in the process of obscuring glass, consists in mixing the materials, which are used to produce this effect, with boiled oil, and transferring impressions from engraved metal plates on to the glass; thus producing obscured patterns on transparent grounds.

The patentees claim as their invention, in those processes for ornamenting glass where staining, stopping-out, or obscuring materials are used; first, the transferring of the said materials, in the form of impressions from engraved plates of metal, on to the glass, in the same manner as now practised in printing in enamel on glass; which they are enabled to accomplish by mixing the said materials with boiled linseed or other oil, as aforesaid. And, Secondly,—the application of the staining material, so mixed with oil, as aforesaid, to pot metal, or to flashed glass, generally; by which improved mode of operating with the said materials, they are enabled greatly to improve, perfect, render more exact, diversify, and multiply the combinations of patterns, grounds, and devices, for ornamenting such glass, as aforesaid, and to produce the same, so ornamented, at a cheaper rate.—[*Inrolled in the Rolls Chapel Office, May*, 1842.]

To James Heywood Whitehead, *of the Royal George Mills, near Saddleworth, in the County of York, manufacturer, for improvements in the manufacture of woollen belts, bands, or driving-straps.*—[Sealed 2nd November, 1840.]

These improvements consist in the application to woollen bands or straps of a mixture of linseed oil and resin, for the purpose of giving them sufficient firmness or adhesiveness to be used, instead of leather straps, for driving machinery. The

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oil is first boiled, and the resin, in a finely pulverized state, is then stirred into it, in the proportion of about two pounds of resin to three pounds of oil; but the patentee does not confine himself to these proportions. The band or strap is passed through the mixture, and between two weighted rollers; after which it is stretched in the direction of its length, and, when dry, is ready for use.—[*Inrolled in the Inrolment Office, May*, 1841.]

To WILLIAM HANCOCK, Jun., *of Amwell-street, in the County of Middlesex, Gent., for certain improvements in bands, straps, and cords, for driving machinery, and other mechanical purposes.*—[Sealed 3rd December, 1842.]

THE first improvement, under this patent, consists in manufacturing flexible flat bands or straps, by placing thin veneers of ash, lancewood, or any other species of wood possessing flexibility and toughness, or sheets of canvas, strong hempen sail-cloth, vellum, or parchment, between two strips of hide, leather, woollen cloth, or any other suitable material; a solution of India-rubber, or other strong cement, is then applied, in order to unite the whole firmly together, and the edges of the band or strap are secured by metal rivets, or by thread or wire stitching.

The second improvement consists in making flat bands or straps, by substituting for the veneers and sheets, above mentioned, thin strands of leather, India-rubber, vellum, parchment, whalebone, cane, cat-gut, (either round, as usual, or flattened by mechanical pressure,) cocoa-nut fibre, whip-cord, or any similar flexible and strong material, laid either in straight, angular, or curvilineal lines, and at any suitable distances from one another.

The third improvement consists in making flat bands or straps, by interposing between the two outer folds (of whatever material the same may consist) slips of flat metal, flat metal rings, or perforated metal plates, and binding the whole together by means of thread or wire, carried through and through the band or strap, or by any other suitable means.

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The last part of the invention consists in reducing cat-gut bands and cords, as well as whip-cord, to any required degree of flatness, by passing them through a flatting-mill, and thus adapting them to various mechanical purposes, for which their ordinary round form renders them unfit.

In concluding his description of the improved bands, straps, and cords, the patentee says, "what I claim, in respect of each said varieties, is the general arrangement and combination of parts of which the same consists."—[*Inrolled in the Inrolment Office, June,* 1843.]

To WILLIAM NEWTON, *of the Office for Patents, 66, Chancery-lane, in the County of Middlesex, civil engineer, for an improved medical compound or ferruginous preparation, to give tone and vigour to the human system, particularly applicable in cases of weak digestion, and in the diseases called "chlorosis,"—being a communication.*—[Sealed 12th June, 1839.]

THIS improved medicinal compound is a mixture or combination of ferruginous preparations with farinaceous matters, intended to be taken into the stomach by way of food, in the form of bread, biscuits, or cakes.

The invention, as communicated to the patentee by M. de Herrypon, of Paris, is directed to be carried into effect by the following means:—A given quantity of ferruginous preparation (say of the soluble salts of iron) is to be dissolved in a suitable quantity of water, and this water, so impregnated with the iron, is to be employed as the menstruum or liquid for mixing up a given quantity of flour into dough. The proportions of the iron to the flour must be according to the complaint, disease, or physical state of the patient, and may be regulated by the advice of the physician or other medical attendant. The dough, so prepared, having been properly kneaded, is to be baked into bread, biscuits, cakes, or other suitable forms, and is then fit to be eaten by the patient, as an ordinary article of food, as part of his or her daily aliment.

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By such administration of the iron, in small quantities, the constitution of the patient will be gradually restored to its natural tone of health and vigour, and in a much more effective and agreeable manner than if taken in doses by the ordinary means of solution, or by other modes.

This medicinal compound, when made up in the form of biscuits, may be readily carried and used at sea, or upon a journey, as an article of food, and may be continually taken by persons suffering under the complaints above alluded to. In hospitals, and in the army and navy, under circumstances of extensive prevailing disorders among the men, such as scurvy, this mode of introducing iron and other suitable medicines into bread or biscuits, subject to the direction of the medical adviser, will be found to be extremely convenient and efficacious; and the materials may be so mixed, that the patients shall not be aware of the bread, which they are eating, being medicated.

The proportionate quantities of the preparations, to be mixed with the flour employed for making the bread, should be regulated, as above mentioned, by the advice of a medical man, as it is impossible to give any definite directions; for, in all cases, the quantities must depend upon the state or character of the disease to be combated, and of the particular preparations of iron and other matters employed to arrest the disease, or to restore the constitution to health and vigour.—[*Inrolled in the Rolls Chapel Office, December*, 1839.]

Specification drawn by Messrs. Newton and Son.

To JOHN ANNES, *of Plymouth, in the County of Devon, painter, for a new and improved method of making paint from materials not before used for that purpose.*—[Sealed 16th January, 1841.]

THIS new method of making paint consists in employing for that purpose the sulphurets of copper, lead, antimony, and iron, (iron pyrites,) granite, gneiss, elvanstone, felspar, and quartz; these are reduced to an impalpable powder, by stamp-

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ing, crushing, or grinding; and one hundred weight of any one or more of them is combined with as much of the mixture, hereafter described, as will form a thick paste, which is then levigated with two gallons and a half of linseed oil; and the desired tint is given by the employment of any suitable coloring matters. When either of the four sulphurets, above mentioned, is used, an addition must be made of four pounds of sulphuric acid, four ounces of hydrate of potash, and eight ounces of sal-ammoniac.

The mixture above referred to, for forming a paste, is composed of two gallons of water, eight ounces of sugar of lead, eight ounces of sulphate of copper, eight ounces of sulphate of iron, eight ounces of sulphate of zinc, and twenty-four ounces of alum.

The patentee claims the mode of manufacturing paint, as herein described.—[*Inrolled in the Inrolment Office, May*, 1841.]

ON THE LAWS RELATING TO LETTERS PATENT FOR INVENTIONS.

No. VI.

ON THE PATENT LAWS OF PRUSSIA.

To a casual reader, the law, which we have now under our consideration, would appear to be constructed purely for the realization of that hope which the humble inventor, after toiling long in secret to perfect some great discovery, naturally fosters in his breast, namely, of meeting with the protection his industry deserves, instead of being cast upon the world to beg of others their pecuniary aid in purchasing that protection which government can alone bestow. This expectation would certainly arise when reading the following words:—"*In order to encourage the arts and manufactures no patent tax shall be paid;*" and he would consider he had at last found a country that could appreciate the blessings arising from the ingenuity and skill of the artisan, and the laborious experiments of the scientific investigator. We must however instance this as another exemplification of the proverb, "all is not gold that glitters;" for although the government does not lay any direct tax upon patents, yet the course adopted, when

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applications are made for patents, for highly meritorious and useful inventions, is such, that inventors would hail with delight the imposition of even a heavy tax, rather than be subjected to the present vexatious proceedings, and refusals of protection, from frivolous causes.

It will be seen, upon perusing the Royal Ordinance, that all applications are referred to a board or committee, who examine and report thereon, to the Minister of Finance, as to the novelty of the invention, and the expediency of granting a patent. Instead, therefore, of confining themselves to the question of whether the invention will be advantageous or otherwise to the public at large, or to the branch of the arts to which it particularly refers, the committee enter upon a very minute enquiry as to the alleged novelty of the invention, thereby constituting themselves supreme judges on a subject of which their ignorance is only equalled by the firmness they exhibit in adhering to their avowed opinion. We do not wish it to be understood, when we speak thus strongly against the decisions of this board, that we disapprove of the existence of such a restrictive power; on the contrary, we should wish to see such power placed in judicious hands, and exercised in England, as it is found to work well in the United States of America; but that an applicant should, on the mere assertion of a few individuals, be hopelessly deprived of the protection held out to him by the law, and which, indeed, common justice demands, for the conservation of man's intellectual works, is a grievance that should be immediately redressed, if Prussia wishes to be, in future, ranked among the nations encouraging and cultivating arts, sciences, and manufactures. Our readers will readily conceive the disappointment this restrictive system engenders, when we state, that out of one hundred applications made to the Prussian Government, the average number of grants issued does not exceed ten. The following is a translation of the Royal Ordnance under which patents are granted:—

Rogal Ordinance, extracted from the Official Gazette of December 1st, 1815.—*No.* 47.

As it is necessary to inform the public of the regulations which are established, relative to obtaining patents of invention in the States of the Prussian Monarchy, for the exclusive use and enjoyment of any invention, whether new, considerably improved, or imported from a foreign country,—I hereby make known to the

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public, in compliance with the order of the Cabinet of the 27th September of this year,—

1st. That any citizen or member of a commune may obtain a patent.

2nd. That any new invention, or improvement, or any invention imported, for the first time, from a foreign country, may become the subject of a patent.

3rd. That whoever wishes to obtain a patent for any invention, improvement, or importation, must make application for the same to the provincial authorities, and attach to such application an exact description or representation of the said invention, improvement, or importation, either in writing, or by means of models and drawings, or, when practicable, by these three methods united; and he must also declare, whether he wishes the patent-right to extend over the whole of the kingdom, or only a portion thereof, and what term of protection he desires to obtain.

The Government shall cause such application to be examined by competent persons, who shall make a report thereon to the Minister of Finance, by whom the application of the petitioner must be again examined with regard to the propriety of granting the patent, the space of country over which the patent is to extend, and the duration of protection. He shall then grant the patent, and carefully preserve the models, drawings, and description.

4th. That the shortest duration of a brevet shall be six months, and the longest fifteen years.

5th. That any person who shall obtain a brevet, must, within six weeks at furthest, publish the subject of his brevet in the public journals of the provinces for which the brevet shall have been delivered; and should this publication not take place within the time above mentioned, the patent will be considered annulled or repealed.

6th. That whoever shall obtain a patent, must, within six months, put the invention into operation, and in default thereof the grant will become void, and the invention will be open to public use.

7th. That in order to encourage the arts and manufactures, there shall be no direct patent tax,—the only expenses to which the brevet is liable are incidental expenses and stamps. It should, however, be understood, that whoever shall obtain a patent, must pay the contributions determined by law.

8th. That when any person can prove that he has previously

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or coincidently discovered or perfected, upon the same plan, any invention for which a patent has been granted to another, the patent so granted cannot prevent the party from making use of his invention in any manner he may think proper.

9th. That whenever any inventor considers his patent-right infringed by another party, he must lodge a complaint with the provincial authorities, under whose jurisdiction the person of whom he has to complain resides, and the Government shall give judgment upon the complaint, in the manner hereafter mentioned, subject to an appeal to the Minister of Finance.

10th. That whoever shall be convicted of having infringed or done any thing to the prejudice of the rights obtained by means of a patent, shall pay the expenses and costs occasioned by the suit, and he shall be cautioned not to make use of or apply the invention for which the patent has been granted, during the term that the said patent shall remain in force; and the party infringing, shall be informed that in the event of a repetition of the offence, he shall be punished by the confiscation of the instruments, tools, apparatus, materials, and articles, made; and that all the articles thus confiscated shall be given to the proprietor of the patent, in order that he may employ them for his own use; and the proprietor of the said patent shall also have the privilege of bringing an action for damages against any person that shall have infringed upon his rights.

(Signed) De Bulow.

Paris, 14th, October, 1815.

Subsequent to the promulgation of this law, it was found necessary to issue some further instructions relative to the granting of patents to foreigners, and also to regulate the charges to be paid by the petitioner. A document, embodying the necessary instructions, was issued in the year 1828, by the Minister of the Interior; it is as follows:—"In answer to the letter of the Minister of Foreign Affairs, of the 29th July, of this year, I have the honor to observe, that although mention is only made of *subjects* in the Ordinance of 14th October, 1815, relative to the granting of patents, yet foreigners have not the less right of petitioning upon this subject, either directly to the Minister of the Interior, or through the medium of the Ambassador; and when it has been decided that the petitioner has a right to the patent applied for, he may either acquire the right of citizenship,

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or transfer and make over his patent right to a citizen of the Prussian States, under whose name the patent will then be delivered. The fees and expenses of making out and issuing a patent, granted for the whole monarchy, amount to eighteen crowns, twenty-six schellings, and three pence. The expenses of advertising in all the official journals will depend upon the extent of publication the patentee may be required to make. It may be valued at about one hundred and thirty crowns."

The Minister of the Interior,

COMTE DE SCHUCKMANN.

BERLIN, 18*th September*, 1828.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

February 7th, 1843.

The PRESIDENT in the Chair.

No. 589. "An Investigation of the comparative loss by Friction, in beam and direct-action Steam Engines."—By William Pole, Assoc. Inst. C. E.

(Continued from page 494, Vol. XXII.)

Mr. Davison stated that he some time ago made several practical experiments with an Indicator, constructed by Messrs. Maudslay and Field, for the purpose of ascertaining the power required to drive various kinds of machinery, in Messrs. Truman, Hanbury, Buxton, and Co.'s Brewery.

1st. He found, that an engine which indicated 50 horses power, when fully loaded, showed, after the load and the whole of the machinery was thrown off, 5 horses, or one-tenth of the whole power.

2nd. 190 feet of horizontal, and 80 feet of upright shafting, with 34 bearings, whose superficial area was 3300 square inches, together with 11 pair of spur and bevel wheels, varying from 2 feet to 9 feet in diameter, required a power equal to 7·65 horses.

3rd. A set of three-throw pumps, 6 inches in diameter,

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pumping 120 barrels per hour, to a height of 165 feet, = 4·7 horses.

By the usual mode of calculation, (viz., 33,000 lbs. lifted one foot high per minute,) it would appear that there was, in this case, friction to the extent of 13 per cent.

4th. A similar set of three-throw pumps, 6 inches in diameter, pumping 160 barrels per hour, to a height of 140 feet, = 6·2 horses.

By the same mode of calculation as before, there was here, friction to the amount of 15 per cent.

5th. A set of three-throw pumps, 5 inches in diameter, raising 80 barrels per hour, to a height of 54 feet, = 1 horse.

By calculation, as before, the friction amounted to 12½ per cent.

6th. A set of three-throw "starting" pumps, pumping 250 barrels of beer, per hour, to a height of 48 feet, = 4·87 horses.

By calculation, as before, the friction amounted to 15½ per cent.

7th. Two pair of iron rollers and an elevator, grinding and raising 40 quarters of malt per hour, = 8·5 horses.

8th. An ale-mashing machine, made by "Haigh," of Dublin; mashing at the time, 100 quarters of malt, = 5·68 horses.

9th. Two porter-mashing machines, made by "Moreland," mashing at the time, 250 quarters of malt, = 10·8 horses.

10th. 95 feet of horizontal "Archimedes screw," 15 inches diameter, and an elevator, conveying 40 quarters of malt per hour, to a height of 65 feet, = 3·13 horses.

Mr. Davison promised to continue these experiments, and to communicate the results to the Institution.

Sir M. Isambard Brunel presented a design intended to illustrate the mode of securing the poling-boards of the shield of the Thames Tunnel.

The poling-boards shown in the drawing, he described, as being intended to close the whole area of the excavation in the front, as the side and top staves were intended to secure the sides and top of it.

The shield (weighing nearly 180 tons), in passing over the ground, served materially to compress it, and make a firmer foundation for the tunnel. When it was considered that the mass of ground removed, weighed 63,000 tons, while the brick structure by which it was replaced, weighed only 26,160 tons, some idea

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might be formed of the difficulties which had been encountered in the progress of this undertaking.

It would be seen by reference to the early reports, that 540 feet of tunnel had been made in the course of sixteen months, viz., from the 1st of January, 1826, to the 27th of April, 1827. At that period the miners and bricklayers struck, without even securing their work. In this emergency, after standing still a week, new hands were engaged; the result was, that on the 18th and the 12th of May, the ground showed symtoms of giving way, and on the 18th, the river broke in and completely filled the tunnel; the length of brickwork then completed was about 550 feet.

He was convinced that no irruption would have occurred but for the desertion of the men, for at no previous period had so much work been done; the average progress being 12 feet per week for sixteen weeks, and having at that time the advantage of his son's services and those of experienced assistants, the work might have continued, and the tunnel would have been finished in about four years.

After this irruption, an advance of only 50 feet was made within the period of the year 1827, and in consequence of a second irruption, the work was totally abandoned.

In the year 1835, after a lapse of seven years, being liberally assisted by the Government, a new shield was provided, and the work was resumed in the beginning of March, 1836.

The work however, proceeded very slowly, as contrasted with former periods. On the 11th of June the water broke in, and continued to trouble the works for six weeks. Having succeeded in repelling this attack, the progress for the whole year amounted to 117 feet.

Foreseeing that he should at some future period, have to account for the causes of these delays, Sir Isambard instituted, in the course of the year (1836), distinct sets of records for every branch of the service, afloat as well as underground, in order to place beyond doubt, the circumstances which might not otherwise be credited. These registers enabled him to give the minutest details of the work, and would, he hoped, be found useful in any future similar undertaking.

Through the whole of the year 1837, the progress was only 28 feet 4 inches, a rate which hardly exceeded that of a fortnight of the year 1827. Two irruptions took place within the range of eight feet, owing to the looseness of some portions of the strata, which were so fluid, that the only expedient for advancing, was

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by forcing forward some of the polings with the screws. The frequent bursts of gas at that period, and in 1838 and 1839, had moreover such an effect upon the men, that some of them fell senseless at their post. There was therefore great risk of the poling boards falling down, as had been the case before, and causing a total disruption of the ground.

In this dilemma, the expedient of connecting the poling boards with each other by hooks, was resorted to, forming by this means a complete panel in the face of each of the 36 cells of the shield; the top poling being suspended to the head of the cell, the panel could not be disturbed, even with a cavity in front of it; there was likewise an additional means of supporting the polings, by iron spurs resting upon the floor-plates and going into the ground.

Notwithstanding the apparent increase of labour occasioned by this addition to the poling-boards, good progress was made, amounting to 249 feet in the course of twelve months, and the hooking was found so safe in its service and its results, that were another tunnel to be constructed, Sir Isambard stated, that he would make the system of attaching the poling-boards, an essential part of the organization of the shield, being convinced that it might by this means, be worked through the worst ground, with a certainty of safety and success.

February 14th, 1843.

The PRESIDENT in the Chair.

No. 593. "Description of Mr. Clay's new Process for making Wrought Iron direct from the Ore; as practised at the Shirva Works, Kirkintilloch, Scotland."—By William Neale Clay.

In this communication, the author first describes the various stages through which the metal passes, between the reduction of the ore and its arriving at the state of malleable iron, by the ordinary mode of manufacture; and then he explains the process which he has invented, and introduced practically at the Shirva Works.

By the ordinary system of iron-making, the ores are reduced into the state of carburet of iron, and then, by refining and puddling, the metal is de-carburetted, thus making it into malleable iron by a number of processes, which are recapitulated:—

1st. Calcining the ore.

2nd. Smelting in a furnace, by the aid of blast, either cold or heated, with raw coal, or coke, for fuel, and limestone as a flux.

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3rd. Refining the "pig" into "plate" iron.

4th. Puddling, shingling, and rolling, to produce the "rough," "puddled," or No. 1 bars.

5th. Cutting up, piling, and rolling, to produce "merchant," or No. 2 bars.

6th. A repetition of the same process, to make "best," or No. 3 bars.

Seeking to diminish the number of manipulations, by the new process a mixture of dry Ulverstone, or other rich iron-ore (Hæmatite), is ground with about four-tenths of its weight of small coal, so as to pass through a screen of one-eighth of an inch mesh. This mixture is placed in a hopper, fixed over a preparatory bed, or oven, attached to a puddling furnace of the ordinary form. While one charge is being worked and balled, another gradually falls from the hopper, through the crown, upon the preparatory bed, and becomes throughly and uniformly heated; the carburetted hydrogen and carbon of the coal, combining with the oxygen of the ore, advances the decomposition of the mineral, while, by the combustion of these gases, the puddling furnace is prevented from being injuriously cooled. One charge being withdrawn, another is brought forward, and in about an hour and a-half the iron is balled, and ready for shingling and rolling.

The cinder produced, is superior in quality to that which results from the common system; it contains from 50 to 55 per cent. of iron, and is free from phosphoric acid, which frequently exists, and is so injurious, in all the ordinary slags: when resmelted, it produces as much No. 1 and No. 2 cast-iron, and of as good quality, as the ordinary "black band" ore of Scotland.

The cast-iron produced from the slag (amounting to one-third of what was originally contained in the ore) is mixed with the ore and coal in the puddling furnace; and thus, while nearly all the iron is extracted from the ore, as much wrought-iron is produced in a given time, and at the same cost of fuel, as by the old system.

The first process, producing puddled bars of superior quality, is consequently on a par with the fourth stage of the old system, as it avoids the necessity of the preceding separate manipulations.

From the absence of all deleterious mixture, by once piling and reheating the rough bars, iron is produced, of a quality, in every respect equal, and in powers of tension superior, to that which results from the second piling and reheating in the common mode; it is therefore contended that the two processes produce from the Hæmatite nearly one-third more iron, of as good a quality as is usually obtained by the six processes of the old system.

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The iron thus produced bears a high polish, is very uniform in its texture, is ductile and fibrous, having more than an average amount of tensile strength, and at the same time appears to be more dense, as it possesses a peculiar sonorousness, resembling that of a bar of steel when struck. It has also been converted into steel of a good quality.

The paper is illustrated by a drawing of the furnace necessary for the process, and by specimens of the iron and steel produced.

Mr. Clay contended that the ordinary method of making iron was neither so scientific, nor so practically good as there was reason to expect it would have been, when iron formed so considerable an item in the productive industry of the country. His invention was in some degree based upon the old Catalan fire, wherein malleable iron was produced direct from the ore, although by a considerable expenditure of fuel: by this process the ore was also reduced at one operation into the state of malleable iron, by combination with a large portion of carbonaceous matter; and as the deoxydation of the ore could proceed simultaneously in an adjoining preparatory bed, through which the flame of the puddling furnace traversed, there was necessarily a great saving of time, labour, and fuel, in the production of the metal, while the quality was at the same time improved. He argued, therefore, that if the system was generally adopted, a large portion of the capital now sunk in the expensive constructions of blast furnaces, blowing engines, &c., would be dispensed with.

Mr. Taylor observed, that the process appeared to be only applicable to the rich qualitities of iron ore, which were now used in comparatively small quantities, as a mixture with the clay ironstones of the coal fields, from which iron was generally produced in this country. There existed large quantities of Hæmatite in Great Britain, equal in quality to that of Nassau, or of the Hartz mountains, from which so much iron was made, for converting into steel. The mines of Ulverstone alone now produce 50,000 tons annually, and at least 25,000 tons more could be shipped from Cornwall; and if a demand existed, there was scarcely a limit to the quantity that could be raised. He apprehended that the iron made by this process could be converted into good steel: this was very desirable, as it would render this country independent of Sweden and Russia, whence nearly all the steel-iron was now imported.

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Mr. Heath had examined Mr. Clay's process of iron-making, and found that the wrought-iron produced from a mixture of Scottish pig-iron and Hæmatite ore, was of a superior quality, bearing severe tests without injury. The iron made by this method, from Indian pig-iron and specular iron ore (per-oxyde of iron), from Devonshire, which was identical in quality with the celebrated Elba ore, when converted into cast steel, by a process which he had accidentally discovered, possessed the quality of welding like shear steel, without any of its defects. The method he alluded to, was to combine manganese with the cast steel in the crucible, and when drawn out under the tilt hammer, it could be worked and welded to iron, like shear steel: the consequence of this discovery was, that the latter quality of steel was almost abandoned for cutlery, and the former was now generally used, as it did not exhibit the laminated appearance when polished, which shear steel frequently did. The metal was sounder, and fewer wasters were made. All the brown Hæmatites contained manganese, and there was little doubt that, by selecting the proper kinds of ore, malleable iron might be made in Great Britain by this process, as good for converting into steel as any of the Swedish iron. There was abundance of specular iron ore on Dartmoor, equal to the Elba ore, and which would (he had little doubt) produce as good iron as that from the Dannemora ore.

Dr. Faraday remarked, that the process invented by Mr. Clay was founded on sound chemical principles. It was desirable to abandon the use of limestone as a flux: it was proved that the purest limestones contained phosphates, which, although advantageous in agricultural processes, were detrimental in iron making.

Mr. Fox had tried some specimens of Mr. Clay's iron, and found them to bear severe tests, as well as the best cable bolt iron made in the ordinary manner.

Mr. Clay explained that Mr. Heath's process was not indispensable, for converting into steel the iron made by his method; and also that argillaceous iron ores, after calcination, could be treated in his furnace, like the Hæmatite ores, but not so advantageously.

Mr. Taylor said that 25,000 tons of steel were converted annually in this country, and of that quantity not more than 2,500 tons were made from the best Swedish iron; for the remainder, inferior qualities of iron, such as Russian iron, marked CCND, from the forges of Monsieur Demidoff, were used. All that iron was made with charcoal, and could only be called inferior when compared with that made from the Dannemora ore. If Mr. Clay's process was

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successful in treating the Hæmatite ores, as had been stated, it was of great importance, as it would emancipate the country from a dependence upon foreign products.

He had recently seen in Germany, a process of producing steel by stopping the operation of puddling pig-iron at a certain point, or intermediate state between cast and wrought-iron, and hammering the mass at once into bars. The operation was one of much delicacy, and depended entirely upon the skill of the workman.

Mr. Heath believed the manufacture of steel was involved in unnecessary mystery; it was the general opinion that foreign iron was essential to produce good qualities. Iron as now made from coke furnaces certainly contained too much foreign matter to be used for steel, and it would require more attention to the selection of the materials, before pure iron could be obtained; some of the Low Moor iron, the good quality of which was universally admitted, had been made into blistered steel, but although the springs made with it appeared perfect, it was said that they did not answer so well as those made with steel from charcoal iron.

The Sheffield manufacturers required that steel should possess "nature and body;" the first quality to enable it to be rolled and drawn out without cracking, and the second that it might receive and retain a fine edge. Steel made from Garnderris iron (South Wales) possessed "nature," but if made into cast-steel, it fled into pieces in working, as it did not possess "body." Steel from German ores appeared to have "body," but wanted "nature." Steel from Indian iron, although difficult to work, stood better than other kinds when once reduced into form; this he attributed to the purity of the magnetic ore from which it was produced; there was not the slightest trace of phosphorus, arsenic, or any deleterious foreign matter. He was convinced that, with a mixture of Indian pig-iron (which could be produced very cheaply) and Devonshire ore, by Mr. Clay's process, iron could be made of excellent quality for converting into steel at such a reduced price as would render the introduction of Swedish and other foreign iron unnecessary.

Mr. Taylor believed that improvement in the quality of steel, rather than reduction in the price was the object to be sought. In the large quantity used in the mines under his direction, the dearest steel was found to be the more economical. He had seen as many as twelve dozen borers used to make one blast hole, and unless the tools kept their points well, the labour of the men was thrown away.

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February 21, 1843.

The PRESIDENT in the Chair.

No. 594. Mr. Giles presented a plan and sections of London Old Bridge, made from his surveys of it in 1820, by order of the Committee of the Bridge Lands, with descriptive notes.

The plan represents the sterlings, piers, parapets, and roadway of the bridge, with its low water channels, called locks, and the soundings through the locks.

The sections represent an elevation and levels of the sterlings, piers, arches, roadway, and locks, with levels of the tides observed at the bridge in September and October, 1820. The datum to these levels being the Trinity high-water mark of London, which is recorded on a stone let into the lower external wing of the Hermitage entrance of the London Docks.

From the plan it appears that—

	Ft.	In.
The aggregate waterway between the piers above sterling height was	524	2
The width occupied by the piers	406	10
Making the total length between the abutments of the bridge	931	0
The aggregate waterway below the sterlings at low-water was	230	11
And the aggregate distance occupied by the piers and sterlings at low-water was	700	1
	931	0

The level of the tides shows—

	Ft.	In.	
The extraordinary high-water mark of springs to be	2	0	above datum
The average high water-mark of springs, between 23rd September and 25th of October, below bridge	0	6·5	under ditto.
The same above bridge	1	2	„

Making the high-water of spring-tides above bridge 7·5 in. under the same high-water below bridge, owing to the obstruction which the piers presented to the tides attaining their full height above bridge; and this difference was found commonly to be 8 in.

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The average high-water mark of neap-tides above bridge was - - - - - - - - - 4 3 „
And the difference of high-water of neap-tides below and above bridge was not observable.
The average level of low-water mark above bridge was - - - - - - - - - - 14 5 „
The average level of neap-tides low-water mark below bridge was - - - - - - - - 16 6 „
The average level of spring-tides low-water mark was - - - - - - - - - - 18 9 „

Thus the average fall of water through the locks of the bridge at neap-tides was 2 ft. 1 in., and the same at spring-tides was 4 ft. 4 in. But an extreme fall of 5 ft. 7 in. was observed through these locks on the occurrence of a high land flood, and a spring-tide ebb.

Having completed the surveys of Old London Bridge, Mr. Giles subsequently took the levels of the tides from thence to Teddington lock, and found that in the absence of high winds and land-floods, the high water of spring-tide on the upper side of London Bridge attained its level or height at all the London bridges, also at Battersea, Putney, Kew, and Richmond bridges, and at Teddington lock.

No. 592. "Account of a series of experiments on the comparative strength of solid and hollow Axles." By John Oliver York. Assoc. Inst. C. E.

The author first describes the causes of fracture in railway axles, which he attributes to the sudden strains and injury produced by concussion and vibration. Those resulting from concussion are chiefly ascribed to a defective state of the permanent way, any sudden obstacle opposing itself to the progress of the train, and the severe shocks arising from the wheels coming in contact with the blocks and sleepers when thrown off the line. The force of vibration and its certain effect to produce fracture in a body so rigid as a railway axle, is then fully explained; the evil arises from the impossibility of diverting from the axle the continued series of slight blows or vibrations to which it is subject, or of causing a free circulation of them through its entire length, since the naves of the wheels being fixed tightly on to the axles, form a point on either side for the vibrations to cease, and the particles of iron composing the axle at this point become dislocated by the continued and unequal strain, and ultimately break; the same action is

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described as taking place in the journal of the axle, and hence the fact that an axle seldom breaks excepting at the journal, or at the back of the nave of the wheel. The twisting strain to which railway axles are subject, is next considered, and a calculation entered into, to prove that upon a circle of only a few feet in diameter, and assuming a first-class carriage on four wheels to weigh 6 tons, the strain resulting from this cause is so slight as to be unworthy of consideration in the inquiry. The paper next proceeds to point out, how and why the hollow axle is better able to resist the strains before referred to, than the solid ones now in use.

First, by the process of manufacture, by which the crystallization of the iron is avoided, and it is left in a better state for sustaining sudden strains and continued action. Secondly, by the position of the metal composing the axle, since the comparative strength of axles are as the cubes of their diameters, and their comparative weights only as their squares,—consequently, with less weight, there must be increased strength: and Thirdly, that the vibration has a free circulation through the length of the axle, no part being subject to an unequal shock from the vibration, and the axle would therefore receive much less injury from this cause. In conclusion, it is submitted that a railway axle should possess the greatest possible degree of rigidity between the wheels, to prevent it from bending or breaking from concussion, combined with the greatest amount of elasticity and freedom in the particles of iron within the axle itself, to prevent the injurious effects of vibration.

The details of a numerous set of experiments are then given, to prove the superiority of the hollow axle in all these respects; the average of the whole of which is thus stated.

As regards rigidity to sustain a dead weight:—

The axles being supported at the ends, and the weights applied in the middle.

Hollow Axle.						Solid Axle.			
Weight.				Deflection.	Permanent Set.	Weight.		Deflection.	Permanent Set.
Tons.	Cwt.	Qrs.	Lbs.	Inch.	Inch.	Tons.	Cwt.	Inch.	Inch.
7	14	..	6	$\frac{1}{16}$	..	7	14	$\frac{6}{16}$	$\frac{1}{16}$
9	2	..	..	$\frac{3}{16}$	..	8	1	$\frac{8}{8}$	$\frac{5}{32}$
9	16	..	..	$\frac{8}{8}$	$\frac{1}{8}$				

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As regards its capability to resist a falling weight:—

5 cwt. 3 qrs. 6 lbs. falling from a height of 16 feet on to the centre of the axle.

Hollow Axle.		Solid Axle.	
1st blow, deflection - -	1½	1st blow, deflection - -	1¾
2nd „ „ - - -	2¼	2nd „ „ - - -	3¼
3rd „ „ - - -	3¼	3rd „ „ - - -	4¼

As regards the elasticity and fibrous quality of the journals:—

Hollow Axle.		Solid Axle.	
Number of blows to destroy journal (average)	28	Number of blows to destroy journal (average)	10

Proportions of axles:—

	Hollow Axles.	Solid Axles.
Diameter	4 inches	3½ inches.
Weight	1 cwt. 2 qrs. 20 lbs.	1 cwt. 3 qrs. 24 lbs.

The paper is illustrated by specimens of the broken axles, both hollow and solid, and by diagrams of the mode of manufacturing the two kinds of axles.

Mr. Geach presented a series of specimens of ends broken off solid axles, made by the Patent Shaft and Axle Company, Wednesbury; they had borne severally 886, 148, 293, and 278 blows of a sledge-hammer, weighing 38 lbs. before they separated from the body:—above twenty more ends had been broken off, the weakest requiring 138 blows. The diameter of these journals was 2½ inches.

An axle was exhibited which had been bent nearly double under an hydraulic press, with a pressure of 64 tons: the journals (2½ inches diameter) were also bent in opposite directions, by repeated blows of a sledge-hammer, without any signs of fracture being perceptible.

The firm, which Mr. Geach represented, had made upwards of twenty-five thousand axles, and had tried a very large number by breaking them; they almost uniformly found them of good quality, which might be attributed to the mode of manufacture. Around a centre bar of iron were placed eight bars rolled to a proper form to complete a circle, the joints radiating from the centre; they were then welded together by rolling, and finished under the hammer; the fibre of the iron, it was contended, was thus worked, and remained in its most favorable position.

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He was not opposed to the principle of hollow axles, but he wished to prevent any unnecessary prejudice against solid ones, by inferences from any one set of experiments: he would therefore suggest that another series of experiments should be made between the relative strength of the two kinds of axles, for which he would contribute the necessary number of solid ones.

Mr. York described the manner in which the solid axles had been selected for the purpose of experiment. Having obtained General Pasley's consent to be present on the occasion, he ordered axles from the Patent Axle Company, and another eminent maker, and selected also several other axles supplied by the Patent Axle Company to the London and Birmingham Railway; these axles were new, never having been under any carriage; he contended that the result of the experiments afforded a fair specimen of the axles generally in use, and were such as the public were in the habit of riding upon. The axles which had since been made by the Axle Company, and were then exhibited to the meeting, showed a quality of iron that could not be surpassed: if this was the usual quality made use of by that company, it still more forcibly proved his position as to the uncertainty of manufacturing solid axles, for while one specimen took a great number of blows to break it, the majority of them were fractured by a slight force; it was this uncertainty which he proposed to avoid, and he contended that it was inseparable from the method of making axles described by Mr. Geach; for in passing the faggot through the rolls to weld the bars together, it frequently happened that they were only united to a depth of one-half or three-quarters of an inch; hence it was to a certain extent hollow, and partially avoided the injurious effect of hammering; if, on the contrary, they were perfectly welded, the iron became crystallized, as in any other solid axle: this fact was proved by the specimens before the meeting, those that were solid having been broken by a very little force, and the unsound ones requiring a great number of blows to produce fracture.

In the experiments, the hollow axles had broken under a different number of blows, but this was owing to their having been made of larger diameter in the journals than the solid ones (but with only an equal quantity of metal in them), and afterwards turned down to the same diameter, which left them of unequal thickness and too thin for a fair test; still however, with less metal than in the solid ones, they were stronger; this might be accounted for by the mode of manufacture, as by retaining the axle hollow, the crystallization of the iron was avoided.

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The present mode of making the hollow axles, he described to be by taking two trough-shaped semi-circular pieces of iron, bringing their edges together, and welding them under a hammer between swages. He however dissented from the process of hammering, and intended to finish his hollow axles by compression only. This, he contended, would avoid the injury done to the iron by the present mode of manufacture, and that with the same quantity of iron, the strength of axles being as the cubes of their diameters, and their weights only as the squares, a hollow axle must possess considerable advantage over a solid one.

Hollow axles had long been considered desirable, but the expense of making them had hitherto prevented their use; he had reduced their cost, by his process, to the same rate as the solid ones, and felt confident that in bringing them under the consideration of the profession, through the Institution, they would be fairly treated and ultimately adopted.

General Pasley confirmed the correctness of the results recorded by Mr. York, and the satisfactory nature of the experiments, which had impressed him with a favorable opinion towards hollow axles. It was of importance to avoid deflection, as it was almost as fatal as fracture in causing accidents. After the late accident on the North Midland Railway, he observed a solid axle bent into the form of the letter C, and the upper portions of the periphery of the wheels nearly touching each other. The hollow axles would certainly resist deflection better than solid ones of corresponding weight.

In answer to a question, Mr. York said that the iron was chiefly injured by the amount of hammering which it received in forging.

Mr. Taylor remarked, that the question of the amount of injury received by iron in working, was discussed at the meeting of the British Association in 1842, and the effects of vibration and electricity had also been treated of by foreign engineers. It appeared to be generally admitted, that the great source of mischief was the cold swageing, which the iron received, in order to give the work a good appearance. In order to test this, Mr. Nasmyth subjected two pieces of cable bolt iron to 160 blows between swages, and afterwards annealed one of the pieces for a few hours. The unannealed piece broke with five or six blows of a hammer, showing a crystallized fracture; while the annealed piece was bent double under a great number of blows, and exhibited a fine fibrous texture. The fact of the fibre being restored by annealing was well understood and practised by smiths, particularly in chain-making.

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Mr. York could not entirely subscribe to the great benefit of annealing, as he had found that after annealing one end of a hollow axle for 48 hours, it was broken off by 82 blows, while the other (unannealed) end of the same axle resisted as far as 78 blows.

In answer to a question from Alderman Thompson, Mr. York said, that he had found as much mischief arise from over-heating iron as from over-hammering it; but the difference of the appearance of the fracture, indicated immediately when iron had been burned.

Mr. Taylor said that in Mr. Nasmyth's experiments, the overheated iron was almost as fragile as glass.

Mr. Gravatt believed that vibration, whether caused by the smith in working the iron, or by the use to which the bar was appropriated, was the reason of its fracture, and it was certain that a constant change was going on in all manufactured iron.—At the Thames Tunnel, the "fleeting bars," used as levers for turning the large screws for forcing forward the shield, never lasted longer than three or four weeks, although they were very strong, and were made from the best materials by careful smiths. They were only used occasionally, and then without any concussion, having only the power of eight men exerted upon them: yet they broke constantly, and the fracture exhibited a bright crystallized appearance. It was found at last, that in order to give them duration, they should be left rough, and not hammered much in working.

Mr. Newton observed, that full ten years since, Dr. Church had used hollow axles for his experimental steam coach on common roads, being convinced of their superiority.

Mr. Fox was an advocate for the hollow axles, but he did not consider the present experiments quite conclusive, as there were differences in the relative dimensions of the axles experimented upon; he would suggest another series of trials, upon a larger number of axles, as the subject was one of great importance, not only to manufacturers but to the public, whose safety in travelling depended upon the goodness of of the axles under the carriages. He had used upwards of 5000 axles made by the Patent Axle Company, and had made many experiments by breaking them; the average result was equal to that quoted by Mr. York. He agreed in the danger arising from over-heating iron, as also from over-hammering it, and for some time past he had caused all the axles to be made 6 inches longer than was necessary, in

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order to cut 3 inches off each end, to try the quality and the appearance of the fracture of the iron.

The President remarked, that there could not exist a doubt as to the greater strength of a hollow axle, as compared with a solid one; both containing the same weight of material; the principal question to be considered was, that of vibration, and its effect upon the cohesive strength of the metal; whether the action upon the particles was more irregular in the solid body and more distributed in the hollow one; he recommended this investigation to some of the mathematicians who were present; the result of their inquiries might materially aid in the development of truth from the practical experiments.

February 28th, 1843.

The PRESIDENT in the Chair.

No. 555. "Description of the roofs over Buckingham Palace, covered with Lord Stanhope's composition."—By Peter Hogg, Assoc. Inst. C. E.

The mixture invented by Lord Stanhope, and used by the late Mr. Nash, for covering the nearly flat fire-proof roofs of Buckingham Palace, is described in the paper as being composed of Stockholm tar, dried chalk in powder, and sifted sand, in the proportions of three gallons of tar, to two bushels of chalk, and one bushel of sand, the whole being well boiled and mixed together in an iron pot. It is laid on in a fluid state, in two separate coats, each about $\frac{3}{4}$ of an inch in thickness, squared slates being imbedded in the upper coat, allowing the mixture to flush up between the joints the whole thickness of the two coats, and the slates being about an inch.

The object in imbedding the slates in the composition, is to prevent its becoming softened by the heat of the sun, and sliding down to the lower part of the roof, an inclination being given of only $1\frac{1}{2}$ inch in 10 feet, which is sufficient to carry off the water, when the work is carefully executed. One gutter, or water-course, is made as near to the centre as possible, in order to prevent any tendency to shrink from the walls, and also that the repairs, when required, may be more readily effected. It is stated, that after a fall of snow, it is not necessary to throw it from the roof, but merely to open a channel along the water-course, and that no overflowing has ever occurred; whereas, with metal roofs it is

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necessary to throw off the whole of the snow on the first indication of a thaw.

These roofs have been found to prevent the spreading of fires, and it is stated, that on one occasion, to test their uninflammability, Mr. Nash had a bonfire of tar barrels lighted on the roof of Cowes castle.

Another advantage is stated to be, the facility of repair which the composition offers, as if a leak occurs, it can be seared and rendered perfectly water-tight, by passing a hot iron over it; and when taken up, the mixture can be remelted and used again.

The author proposes to obviate the disadvantage of the present weight of these roofs, by building single brick walls at given distances, to carry slates, upon which the composition should be laid; instead of filling the spandrels of the arches with solid materials, as has been hitherto the custom.

The reported failures of this species of covering at Mr. Nash's house in Regent-street, and in other places, are accounted for by the composition having been used in one thin coat, laid upon an improper foundation of laths and tiles.

The durability of the roofs, which were carefully constructed with good materials, has been, it is contended, fully proved at Lord Palmerston's house, which was covered with the composition in 1807; Lord Berwick's, in 1810; Sir James Langham's, in 1812; the Pavilion at Brighton, in 1816 and 1823; and nearly the whole of Buckinham Palace, in 1826 and 1829.—The latter roofs are stated to be in perfect order at the present time, and have scarcely demanded any repairs since their completion.

The paper is illustrated by a drawing, showing the mode of constructing the roofs, and the improved method proposed by the author, with specimens of the composition, with slates imbedded, taken from the roof of the palace during some recent alterations.

[*To be continued.*

ON PURIFYING THE AIR IN MANUFACTURING TOWNS.

Unmindful of the wisdom of our forefathers, who, appreciating the value of a pure atmosphere to a large city, prohibited, so early as the reign of Elizabeth, the further enlargement of London, we have, during the present century, been piling earth together in

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the shape of bricks, and raising, in various parts of Britain, such heaps of human habitations, that the power of magic, rather than the hands of man, seems to have produced them. The cause of this accumulation is evident to all; for, from being the disturbers of the world, this nation, having had her energies differently directed, has become the great distributor of comforts, and even luxuries, through the instrumentality of "machinery;" and although it is now the fashion to decry this powerful instrument as baneful to the interests of the country, yet we shall see, ere long, by its more complete development, the energies of man turned from physical to intellectual employment; a change no less desirable, than from being one of the slaves who raised the huge stones to build the mighty pyramids of Egypt, to become the designer of such scientific wonders. During the time then that the improvements in machinery are being developed, we must naturally expect many and serious evils to ensue; but these, though consequent on a new system of things, must not be contentedly endured.

Perseverance, well directed, even if it be not associated with great intellectual powers, may be productive of vast benefit in allaying the evils which have arisen in the general adoption of machinery.—Let us take, for example, the miserable state of the miner, whose numbers have so greatly multiplied, from the demand for coal and iron, and who, while toiling in unhealthy damps and darkness, is constantly liable to accidents, if not to death. Here then is good scope for the industrious mechanician to apply the powers which, by creating other demands, have caused this servile and pernicious labor to increase. The practicability of effecting this revolution, and releasing men from an occupation unfit for them to pursue, will neither be disputed as impracticable nor will the change be considered as undesirable. Another evil, and one most evident to all acquainted with our manufacturing districts, is the congregation of immense volumes of smoke, which hang like a settled pestilence over every town where manufactures flourish; but to this subject attention has already been very generally directed, and many attempts have been made to purify the atmosphere, and restore the pure air of Heaven to the lungs of thousands, who are at present breathing the noxious vapours, slightly diluted, which proceed from the innumerable shafts of steam-engine and other furnaces. Great credit is certainly due to those gentlemen who have exerted themselves in this matter; for it is the poor who suffer, whilst the rich are able to live far away from the polluted atmosphere. Among these

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gentlemen, Mr. West, of Leeds, has, we consider, done good service by collecting into one pamphlet all the schemes which have come under his notice relative to the consumption of smoke; this little work sets forth the different schemes in an intelligible manner, and also gives an account of authentic experiments performed, in order to test the value of the improved furnaces; but, perhaps, no one has so thoroughly interested himself in the subject of smoke consuming as Mr. C. W. WILLIAMS, who, not content with having given it his individual study, has, as much as in him lay, drawn the attention of the learned in science thereto, and also the authorities who control the affairs of manufacturing towns. From a letter, written by this gentleman, and addressed to J. ALSTON, Esq., of Glasgow, we have made some extracts, which we consider will throw some light upon the proper construction of furnaces, whereby smoke may be effectually consumed. The following is a letter which he has given, as stating the opinion of Dr. KANE, Chemical Professor in the Royal Dublin Society, on this subject.—

"The red-hot fuel at the back of the furnace, already in full combustion, gives off abundance of carbonic acid. Now, the fresh coal, when added, is distilled by the heat in the furnace, just as it would be in a gas retort, and evolves a large quantity of olefiant gas, and other, though less important gases, which however act in precisely the same way.

This olefiant gas, streaming over, or coming in contact with the red-hot fuel, is decomposed, and its hydrogen and carbon separated; so that, according as it is more or less heated, hydrogen gas, or light carburetted hydrogen gas, is set free, and carbon deposited.

But this carbon, being then red hot, and finding abundance of carbonic acid, combines with it, and forms colorless carbonic oxide; so that instead of black smoke, invisible gases alone are evolved from the orifice of the chimney—namely, hydrogen, carburetted hydrogen, and carbonic oxide; all of which, however, being combustible, are thus so much fuel lost.

The relative economy of the use of olefiant gas (and the same conditions apply to all gases and vapours that are evolved when a fresh charge of coal is put on the fire) may be thus stated. The heat evolved by the perfect combustion of a ton of coals being indicated by the number 100, there are 74 parts belonging to the coke which it would yield, and 26 to the volatile matters.

When perfectly burned, there is no smoke, and all heat is

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economized. When imperfectly burned, (as in common furnaces,) much solid carbon is thrown out in the form of black smoke; and if the hydrogen be consumed, 9 parts of heat are saved out of the 26, which are due from the volatile parts of the coal, and 17 are lost.

On the plan of the supposed burning of the gases or smoke of the fresh fuel, by making them stream over the ignited fuel behind, visible smoke is certainly avoided, but at the loss of all the heat, at least 26 per cent., due to the volatile matter given off from the coal.

In giving these numbers, I rather understate the value of the heat derivable from the volatile fuel; but even these show the gross disadvantage of that process."

Mr. Williams then proceeds to remark on this letter as follows:—

With so lucid and forcible an illustration before us of the mischievous consequences of this error of drawing an inference from the mere non-appearance of smoke at the chimney summit, I will make a few observations on what is called "smoke burning." The combustible gases (or rather their constituents) may be burned, and no smoke generated; but the combustion of the smoke itself, when once formed, is a practical and chemical absurdity—seeing that this smoke, which is the product of the process of combustion imperfectly effected, by reason of the absence of some of the necessary conditions, cannot be subjected to a second process, or second combustion—the absence of those conditions necessarily still existing. The absurdity is also enhanced when we consider that it involves this inference—that perfect combustion is to be supposed as following imperfect combustion, almost at one and the same time, and in the same furnace. In other words, that the escaping carbon, in its cooled down, deposited state of black smoke, may be retained, or even brought back, to be again raised to the required temperature of incandescence, (which it had just lost,) and to be combined with atmospheric oxygen, the very absence of which had been the cause of its existence in the form of smoke. Dr. Ure says, "I quite agree with you in considering the prevention of smoke to be the true mode of curing the nuisance; for, when once formed, that is, when the carbonaceous particles become deposited, it is impossible effectually to burn them, so as to destroy the smoke which they occasion, or rather constitute."

The test by which we ascertain whether the application of the Argand principle be correct or otherwise, will be found in the al-

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ternate exclusion or admission of the air. If correctly applied, its exclusion will be instantly attended with the discharge of black smoke, whereas its admission will produce a clear light and flame in the flues, with the absence of smoke; just as the lurid flame and smoke appears or disappears, alternately, when we close or open the aperture by which the air passes to the bottom orifice of the Argand lamp or burner.

The whole question, then, of perfect or imperfect combustion of coal, with its gaseous and solid constituents, is a purely chemical question, and depends exclusively on the introduction of atmospheric air to those constituents, in the right time, place, mode, and quantity; and not, as we have been too long in the habit of hearing, on any alleged relative proportions in the areas or dimensions of the several parts of a furnace, or on any ingenious arrangements of bars or other merely mechanical contrivances. It is time that such puerilities be laid aside, and that a chemical subject be conducted in conformity with chemical principles.—The age is gone by for teaching chemistry by the slide-rule. As well may we call on the mariner to find his ship's longitude, or lay down his course, by Wollaston's scale of chemical equivalents, as to teach Thompson or Ure to combine hydrogen and oxygen, nitrogen and carbon, by an algebraic formula, or by reference to some arbitrary rule of proportions between the beak and body of the retort, and without reference to the character or quantities of the ingredients employed.

And what is this process of combustion in the furnace which we are labouring to render perfect, but the bringing together, mixing, and combining these very elements of nature, on chemical principles alone, and in chemical proportions?

As a general and practical observation, then, it may be assumed that between 300,000 and 400,000 cubic feet of air, of atmospheric temperature, are required for the combustion of a ton of coals, according to the nature of their constituents. Two-thirds of that quantity are required for the solid or coky portion, and must be introduced through the fire-bars, and nowhere else. The remainder, or above 100,000 cubic feet, being required for the combustion of the 10,000 cubic feet of gaseous matter—the average gaseous products of such weight of coals.

These latter 100,000 cubic feet of air must, as a *sine qua non*, be introduced to these gases by some other channel or route than through the bars; no additional supply of air, if passed through

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the bars and fuel on them, being equal to satisfying the exigences of the gas. Atmospheric air cannot pass through a body of ignited fuel without losing all, or the greater part of that very oxygen which the gas requires for its combustion. Yet this is just what is overlooked in ordinary practice. These facts alone, chemically authenticated as they are, should be sufficient to distinguish the new from the old mode of managing and constructing furnaces.

The means of admission for this great supply of air to the gaseous matter alone, must be provided for, and forms the first feature of the principle now contended for; while the mode in which that mass of air should be introduced to the gases, so as to satisfy, first, mechanical contact, and next, their chemical union, forms the second feature of the plan.

It is here of the last importance to observe that the mode of introducing the air to the gases is far more essential to success than even the supplying of the requisite quantity, and for this reason, that it is the mode, which determines, whether even the right quantity will be attended with a useful effect, by promoting combustion; or a mischievious one, by inducing a cooling operation, and thus obstructing combustion. It behoves us, then, to remember, that in merely providing the required quantity, we have satisfied but one half the requirements of nature and chemistry—seeing that even the same quantity of air may be attended with a heating or cooling influence, according to the mode in which it is introduced to the other ingredients in the furnace. And who can be ignorant of the fact, that in most ordinary experiments, much will depend on the mode or manner in which the materials are brought together? When, however, our ingredients are of so complexed and self-willed a nature as oxygen, hydrogen, and carbon; and in such enormous quantities, rushing together on the one hand, or counteracting their respective affinities on the other; who will question the necessity for management, in effecting this contact, or the difficulty of its accomplishment?

Under such circumstances, all that human aid can effect, is, the bringing the ingredients together, in such a way as to assist their own inherent and respective properties, affinities, and modes of action; thus to accomplish the largest measure of useful combinations, and the least of those that would be injurious.

The numerous recent improvements in oil and gas lamps, furnish just so many illustrations of the point I am urging, for all are directed to this single purpose—improving the mode by which

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the air is introduced to the heated inflammable constituents of the gas, whether it be from oil or coal.

Indeed, it may be observed, that it is exclusively owing to the difficulty and delicacy of this operation of bringing the air to the gaseous matter, in the furnace, with the required rapidity, and in the required continuing proportions, that mechanical arrangements or adjustments are at all necessary.

Have we not in the well-known operation and use of fire-bars, the most convincing illustration of the subject in hand—the mode of introducing the air? For if the separation of the air into films or divided portions, by means of those bars, (and which is their great end and use,) be absolutely essential for its effective action on the solid fuel, *a fortiori*, we are called on for a corresponding separation of the aerial mass on its introduction to the gaseous fuel. In both cases we effect the same purpose;—first, their mechanical mixture, and, secondly, their chemical union—which is combustion. These are the great objects to which attention should be directed in effecting perfect and economic combustion in our furnaces. On the completeness and rapidity with which we manage these two distinct, but consecutive operations, will depend the perfection of the process of combustion either in the furnace or the lamp.

Having thus briefly touched upon the disadvantages occasioned by the partial development of mechanical improvements, we may, at a future time, return to the subject, and consider what other applications of science may be employed to remedy those disadvantages.

List of Disclaimers
OF PARTS OF INVENTIONS AND Amendments
MADE UNDER LORD BROUGHAM'S ACT.

Thomas Parkin,—disclaimer and memorandum of alteration to patent, granted to Thomas Harper Bennett, dated April 9th 1838, for "improvements in railroad and other carriages; in wheels for such carriages, and in roads and ways on which they are to travel." Filed 22nd July, 1843.

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List of Patents

Granted by the French Government from the 1st of January to the 31st of March, 1841.

PATENTS FOR TEN YEARS.

(Continued from page 410, Vol. XXII.)

To Townsend, of the United States, for a method of manufacturing iron.

Viscount de Travenet, of Paris, for an improved chain with curved links

Varinet-Nauquette, of Sedan, for improvements in the dressing of woollen cloths.

Piel, of Vitre, for a preparation of balm of copahu.

Vouret and Braillet, of Melun, for an improved pump.

PATENTS FOR FIVE YEARS.

To Chagot, of Paris, represented by M. Perpigna, advocate, 2, ter: Rue Choiseuil, for improvements in the printing of calico, paper, and other surfaces.

Clouchet, of Pontacq, represented in Paris by M. Perpigna, advocate, for an improved mill for pulverizing plaster.

Danse Compagnon, of Beauvais, represented in Paris by M. Perpigna, advocate, for improvements in tanning.

Diot, of Lyons, represented by M. Perpigna, advocate, for an improved dredging machine.

Fouque, Sardou, and Armand, of Toulon, represented in Paris by M. Perpigna, advocate, for improved manure.

Gancel, of Roubaix, represented by M. Perpigna, advocate, for improved machinery for actuating the headles in looms.

Huckvale, of London, represented by M. Perpigna, advocate, for an improved method for weighing fluids.

Rice Williams Harris, of London, represented by M. Perpigna, advocate, for improvements in printing cylinders.

Royer, of Poictiers, represented in Paris by M. Perpigna, advocate, for an improved cooking apparatus.

Andries, of Calais, for a straight bolt-frame for making spotted net.

Ardillion, of Paris, for improved opera glasses.

Armfield, of London, for a new system of hooks and eyes.

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Arnoult, of Paris, for improved trouser-straps.
Astier, of Nantes, for a new mode of calcining sulphate of lime.
Auxenfans, of Paris, for a new inkstand.
Baucher de Montuel, of Paris, for an improved coining press.
Belicard, of Montmartre, for an improved apparatus applicable to privy vaults.
Bergue, of Paris, for an improved comb.
Berteaux de Chaillevois, of Paris, for an improved paste for cleansing teeth.
Bigot, of Paris, for an improved cock.
Blevanus, of Paris, for improved lamps.
Brehon and Rivette, of Paris, for a method of extracting gluten from flour.
Brouard, of Havre, for improved tents.
Canteloube, of Marmier of Aurillac, for an improved primer.
Carraine, of Salernes, for a machine for cutting panes of glass.
Chambardel, of Poictiers, for a distilling apparatus for separating alcohol from wine.
De Chavagneux, of Paris, for improved waggons for rail-roads.
Claudot, of Verdun, for a mode of turning into use the gases which escape from coal fires.
Clayette, of Paris, for an improved syringe.
Cognier, of Paris, for a solar lamp.
Damy, of Berry St. Christophe, for the application of ventilation to the English system of grinding flour.
Dangé, (Mademoiselle) for a method of imparting to paper and other fabrics, the property of coloring hair.
Daudé, of Paris, for improved buckles and hooks and eyes.
Debry, of Brest, for improved trusses.
Dennelle, of Herouville, and Burdett, for an improved stopper.
Deslandes, of Paris, for an improved mode of setting metallic eyelet holes.
Digné, of Paris, for an improved hat.
Dubus, of Paris, for an expressive organ.
Dujet, of Dinan, for an improved wheel for spinning flax.
Fournier, of Aigre, for an improved distilling apparatus.
Galesloot, of Liege, for an improved brick machine.
Garbais, of Paris, for pearl buttons.
Garnot, of Paris, for an improved candlestick.
Gautier, of Valenciennes, for an improved mode of distilling coal-gas.
Girardot, of Fougerolles, for an improved mode of carbonizing peat.
Gossin, of Lisieux, for an improved kitchen stove.

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Guerin and Co., of Paris, for an improved bucket, to be used in case of fire.

Guerin, Bouchon, and Co., for an improved mill.

Guindorff, of Paris, for a machine for making metallic eyelet holes.

Guyot, of Paris, for improvements in lamps.

Guyot, of Paris, for the application to coaches and vessels, of a system of illumination founded on liquid hydrogen.

Harding-Cocker, of Lille, for improved combs and cards used in the preparing of wool and other fibrous materials.

Hayem Brothers, of Paris, for an improved stock for gentlemen.

Herbé, of Paris, for an improved canvass.

Hétru, of Paris, for Mauritan lozenges, for clearing the voice.

Husson and Bouzonville, for an improved mechanical frame for packing hats and bonnets.

Jéramée, of Paris, for a portable measuring apparatus.

Jourdain, of Altkirch, for an improved power loom.

Kessels, of Liege, for an improved frame for moulding bricks.

Labussière, of Paris, for mechanism for weaving trousers without seams.

Lauransson, of Paris, for a mode of incrustating precious stones within imitation stones.

Lebert, of Pont, for improvements in ploughs.

Lejeune, of Paris, for improvements in hinges.

Lereux, of St. Germain-en-Laye, for an apparatus for curing smoky chimneys.

Macors and Girard, of Lyons, for a composition to be used as a substitute for plaster.

Malzac, of Meyrucis, for improvements in fire boxes.

Mane, of Paris, for improved shades for lamps.

Marleix, of Lyons, for an improved stock for gentlemen.

Martin, of Paris, for improvements in Galy Casalat's machine.

Mayenne, of Paris, for an apparatus for straightening the teeth.

Mayniell, of Paris, for an improved meter for measuring the flow of water.

Minich, of Paris, for an improved axletree.

Monbro, of Paris, for an improved ink-stand.

Montenot and Jacomy, of Paris, for an improved pump.

Mossier, of Clermont-Ferrand, for an improved pectoral paste.

Noblecœur, of Paris, for an application of a gearing to the shafts of plaster mills.

Nouvion and Bernard, of Montmartre, for the decomposition of alkaline and earthy chlorurets.

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Panchot, of Livry, for improved materials for masonry-work.
Pancera and Jarrosson, of Lyons, for a frame for weaving, at once, two pieces of plush; and the means of dividing the same.
Pascal and Coupy, of Paris, for an improved mode of hanging bells.
Pennequin, of Paris, for a machine for ornamenting metals.
Peteau, of Bohain, for a new mode of manufacturing shawls, with both sides alike.
Picot, of Versailles, for an improved night table.
Pierrard, of Sédan, for an improved mode of using horse power.
Poittevin, of Bourg, for an improved plough.
Polino and Ricaux, of Paris, for transparent fabrics.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th June, 1843, to the 17th of July, 1843, inclusive.

To William Newton, of the Office for Patents, 66, Chancery-lane, in the County of Middlesex, civil engineer, for certain improvements in the preparation of paper, designed for bank notes' government documents, bills, cheques, deeds, and other purposes, wherein protection and safety from forgeries or counterfeits are required,—being a communication from a certain foreigner, residing abroad.—Sealed 5th July.

Robert Faraday, of Wardour-street, Soho, in the County of Middlesex, gas-fitter, for improvements in ventilating gas-burners, and burners for consuming oil, tallow, or other matters,—being a communication made to him when abroad.—Sealed 10th July.

Gregory Seale Walters, of Coleman-street, in the City of London, merchant, for improvements in the manufacture of chlorine and chlorides, and in obtaining the oxides and peroxides of manganese in the residuary liquids of such manufacture,—being a communication from a certain foreigner, residing abroad.—Sealed 10th July.

William Mayo of Lower Clapton, and John Warmington, of Wandsworth-road, Gent., for improvements in the means of, and apparatus for manufacturing gaseous liquors, and for filling bottles and other vessels used for holding the same, and retaining the contents therein, and emptying the same when required,—

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being a communication from a certain foreigner, residing abroad. —Sealed 12th July.

Anthony Bernhard Baron Von Rathen, of Birmingham, in the County of Warwick, engineer, for improvements in fire-grates, and parts connected therewith, for the better consumption of fuel and generation of heat; and improvements in the method and apparatus for the absorption and utilization of heat.—Sealed 12th July.

List of Patents

Granted for SCOTLAND, subsequent to June 22nd, 1843.

To William Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for certain improvements in the preparation of paper, designed for bank notes, government documents, bills, cheques, deeds, and other purposes, wherein protection and safety from forgeries or counterfeits are required,—being a communication.—Sealed 23rd June.

William Needham, of Birmingham, gun-smith, for improvements in fire-arms.—Sealed 4th July.

Robert Smart, of Commercial-road, Bristol, ship-owner, for improvements in paddle-wheels.—Sealed 4th July.

Luke Hebert, of Dovor, civil engineer, for certain improvements in mills or machines for the grinding and dressing, or reducing and separating grain and other substances.—Sealed 13th July.

James Greer, of Woolwich, surgeon, for improvements in apparatus for securing or affixing standing rigging and chains, and other tackle.—Sealed 16th July.

Alonzo Grandison Hull, of Clifford-street, London, M.D., for improvements in electrical apparatus for medical purposes, and in the application thereof to the same purposes.—Sealed 15th July.

Joseph Daniel Davidge, of Greville-street, Hatton-garden, London, mechanist, for improvements in manufacturing certain materials as substitutes for whalebone, applicable to various useful purposes, and in machinery for effecting the same.—Sealed 17th July.

George Parsons, of West Lambrook, Somersetshire, and Richard Clyburn, of Uley, Gloucestershire, engineer, for certain improvements in machinery for beating, cleansing, and crushing

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various animal and vegetable materials or substances.—Sealed 18th July.

Richard Laming, of Radley's Hotel, New Bridge-street, Blackfriars, London, for certain improvements in the purification and application of ammonia, to obtain certain chemical products. —Sealed 19th July.

Sir John Scott Lillie, of Chelsea, London, Knt., for certain improvements in roads.—Sealed 19th July.

Extension to James Lancaster Lucena, of 4, Garden-court, Middle Temple, Barrister at Law, for the term of five years, of a patent granted to Elijah Galloway, for improvements in steam-engines, and in machinery for propelling vessels; which improvements are applicable to other purposes.—Sealed 20th July.

John George Bodmer, of Manchester, engineer, for certain improvements in locomotive steam-engines and carriages, to be used upon railways, in marine engines and vessels, and in the apparatus for propelling the same; and also in stationary engines, and in apparatus to be connected therewith, for pumping water, raising bodies, and for blowing or exhausting air.—Sealed 21st July.

New Patents
SEALED IN ENGLAND.
1843.

To John Duncan, of 72, Lombard-street, London, Gent., for improvements in the casting and construction of types for printing,—being a communication. Sealed 26th June,—6 months for inrolment.

Charles Townsend Christian, of St. Martin's-place, St. Martin's-lane, East India Army Agent, for improvements in the construction of steam-engines,—being a communication. Sealed 27th June, 6 months for inrolment.

Richard Waller, of Bradford, coach-builder, for improvements in locomotive carriages, and in steam-boilers and engines. Sealed 27th June,—6 months for inrolment.

John Thomas Betts, of Battersea, Gent., for improvements in covering and stopping the tops of boxes, jars, pots, and other vessels,—being a communication. Sealed 27th June—6 months for inrolment.

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Edward Johnson, of Nelson-square, Blackfriars-road, surgeon, for improvements in apparatus for bathing. Sealed 27th June—6 months for inrolment.

Alexander Parkes, of Birmingham, artist, for improvements in preparing solutions of certain vegetable and animal matters, applicable to preserving wood and other substances, and for other uses. Sealed 27th June—6 months for inrolment.

Charles Kurtz, of Liverpool, manufacturing chemist, for an improved lamp for the combustion of naptha, turpentine, and other resinous oils. Sealed 30th June—6 months for inrolment.

Charles Tetley, of Bradford, Yorkshire, Gent., for a certain improvement or improvements in the construction of boilers, otherwise generators, for producing steam. Sealed 30th June—6 months for inrolment.

James Lancaster Lucena, of Garden-court, Middle Temple, London, Barrister at Law, for certain improvements in steam-engines, and in machinery for propelling vessels; which improvements were applicable to other purposes,—being an extension of a patent for the term of five years, granted by his late Majesty, King George the Fourth, to Elijah Galloway, of King-street, Southwark, engineer. Sealed 1st July.

James John Greer, of Woolwich, Kent, surgeon, for improvements in apparatus for securing or fixing standing rigging and chains, and other tackle.—Sealed 1st July—6 months for inrolment.

Charles Phillips, of Chipping Norton, Oxford, engineer, for improvements in apparatus or machinery for cutting corn, grass, and such like standing or growing crops, and in apparatus or machinery for cutting vegetable substances as food for cattle. Sealed 3rd July—6 months for inrolment.

Thomas Wedlake, of Hornchurch, Essex, machinist, for improvements in machinery for making hay, which improvements are applicable to other agricultural purposes. Sealed 3rd July—6 months for inrolment.

James Verity, of Leicester-street, Regent-street, boot and shoemaker, for improvements in the heels and soles of boots and shoes. Sealed 3rd July—6 months for inrolment.

James Hartley, of Wear Glass Works, Sunderland, glass manufacturer, for improvements in the manufacture of glass. Sealed 6th July—6 months for inrolment.

James Boydell, Jun., of Oak Farm Works, Stafford, iron-master,

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for improvements in the manufacture of metallic roofs and joists, and improvements in joining sheets or plates of metal for various purposes. Sealed 6th July—6 months for inrolment.

Florimond Delcroix, Jun., of Norfolk-street, Strand, merchant, for improvements in furnaces for locomotive and other engines, and in the apparatus used for regulating the escape of steam and the passage of air in chimneys of furnaces,—being a communication. Sealed 6th July—6 months for inrolment.

James Neville, of Walworth, civil engineer, for certain improvements in the form and manufacture of horse-shoes. Sealed 6th July—6 months for inrolment.

John Wright and Richard Wright, both of Richmond, York, boot and shoe-makers, for certain improvements in boots and shoes, and other the like covering for the feet. Sealed 6th July—6 months for inrolment.

Joseph Cooke Grant, of Stamford, Lincoln, ironmonger, for improvements in the construction of harrows.—Sealed 6th July—6 months for inrolment.

John Woodhouse Day, of Well Field, Durham, land agent, for certain improvements in apparatus to facilitate the loading of vessels with coal, culm, or cinders. Sealed 6th July—6 months for inrolment.

George John Newbery, of King William street, artist, for certain improvements in the manufacture and construction of window blinds, screens, shutters, and other similar articles; parts of which improvements are applicable to other purposes. Sealed 6th July—6 months for inrolment.

Henry Clarke Ash, of Birmingham, manufacturer, for certain improvements in the construction of tea pots. Seled 6th July—6 months for inrolment.

James Booth, of Liverpool, Clerk, Doctor of Laws, for certain improvements in the means of converting rectilinear into rotary motion, and of converting rotary into rectilinear motion. Sealed 6th July—6 months for inrolment.

Thomas Masters, of Upper Charlotte street, St. Pancras, confectioner, for an improved freezing, cooling, churning, and ice-preserving apparatus, the parts of which may be used separately or in combination. Sealed 6th July—6 months for inrolment.

John Joseph Brunet, of Limehouse, Middlesex, Esq., for certain improvements in propelling; parts of which improvements have been communicated to him by a foreigner residing abroad. Sealed 6th July—6 months for inrolment.

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George Parsons, of West Lambrook, Somerset, Gent., for a portable roof for various agricultural and for other purposes. Sealed 7th July—6 months for inrolment.

George Parsons, of West Lambrook, Somersetshire, Gent., and Richard Clyburn, of Uley, Gloucestershire, engineer, for certain improvements in machinery for beating, cleansing, and crushing various animal and vegetable materials or substances. Sealed 10th July—6 months for inrolment.

Jacob Samuda, of Southwark Iron Works, Surrey, engineer, for improvements in the construction of steam-engines, particularly applicable to the purposes of steam navigation. Sealed 10th July—6 months for inrolment.

John Laird, of Birkenhead, Chester, ship builder, for improvements in the construction of steam and other vessels. Sealed 10th July—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for an improved agricultural machine, or implement for ploughing, harrowing, or tilling land,—being a communication. Sealed 13th July—6 months for inrolment.

Richard Laming, of Radley's Hotel, New Bridge-street, Blackfriars, Gent., for certain improvements in the purification and application of ammonia, to obtain certain chemical products. Sealed 13th July—6 months for inrolment.

Joseph Maudslay, of Lambeth, engineer, for certain improvements in machinery used for propelling vessels by steam power. Sealed 13th July—6 months for inrolment.

George King Sculthorpe, of Frederick's Cottages, Coleharbor-lane, Surrey, Gent., for an improved method of fastening and securing bedsteads. Sealed 13th July—6 months for inrolment.

Henry Pinkus, of Duke-street, Portland-place, Middlesex, Esq., for improvements in the methods of applying motive power, in combination with apparatus and machinery, to certain purposes in propelling, and applicable to railways, to ships, or other vessels afloat. Sealed 13th July—6 months for inrolment.

Stephen Geary, of 10, Hamilton-place, King's-cross, architect and civil engineer, for certain improvements in machinery or apparatus for clearing, cleansing, watering, or wholly or partially covering with sand, or other materials, roads, streets, or ways; and which machinery is also applicable to other similar purposes. Sealed 13th July—6 months for inrolment.

William Midworth, of Mansfield, Nottingham, brass founder, for

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certain improvements in the construction of what are commonly called street guard-plates, for public water services, and in the mode of constructing the stop-valves, stoppers, or stop-cocks used therein, and which stop-valves, stoppers, or stop-cocks, are also applicable to various other purposes, where the flow of water, or other liquids, is required to be regulated or suspended. Sealed 13th July—6 months for inrolment.

Henry Smith, of Birmingham, for improvements in apparatus for fastening doors, and in apparatus for giving action to alarums. Sealed 13th July—6 months for inrolment.

William Hutchison, of Ivy Bridge Lane, Strand, marble and stone merchant, for improvements in machinery for cutting marble and other stones. Sealed 13th July—6 months for inrolment.

James Neville, of Walworth, civil engineer, for improvements in obtaining power by means of gases, applicable to working machinery. Sealed 13th July—6 months for inrolment.

Ann Wise, of Saville-row, Burlington Gardens, Parisian corset-maker, for improvements in the construction of stays and umbilical belts. Sealed 13th July—6 months for inrolment.

Robert Ransome, of Ipswich, iron-founder; Charles May, of the same place, iron-founder; Arthur Biddell, of Playford, Suffolk, farmer; and William Worby, of Ipswich, foreman to Messrs. T. R. and A. Ransome,—for improvements in machinery and apparatus used for ploughing and scarifying land, and for raking; and improvements in machinery and apparatus used for thrashing, cutting, and grinding, for agricultural purposes; and improvements in the construction of whippletrees. Sealed 15th July—6 months for inrolment.

James Overend, of Liverpool, Gent., for improvements in printing fabrics with metallic matters, and in finishing silks and other fabrics. Sealed 15th July—6 months for inrolment.

William Garnett Taylor, of Halliwell, Lancashire, cotton spinner, for certain improvements in machinery for spinning cotton and other fibrous substances; and in preparing and dressing yarn for weaving. Sealed 15th July—6 months for inrolment.

James Gollop Beater, of St. Clement's-place, Worcester, tailor, for certain improvements in the fastenings for trousers-straps, and in fastenings for wearing apparel generally. Sealed 20th July—6 months for inrolment.

Henry Austin, of Hatton Garden, civil engineer, for improvements in the construction of water-closets. Sealed 20th July—6 months for inrolment.

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Charles Bertram, of the Borough of Newcastle-upon-Tyne, Esq., for an improved mastic or cement, which may be also employed as an artificial stone; and for coating metals and other substances. Sealed 20th July—6 months for inrolment.

Joseph Harvey, of James-street, Buckingham Gate, Gent., for improvements in the construction of two-wheeled carriages. Sealed 20th July—6 months for inrolment.

William Daniell, of Abercarne, Monmouth, tin-plate manufacturer, for improvements in rolling iron into plates or sheets. Sealed 22nd July—6 months for inrolment.

James Nasmyth, of Patricroft, near Manchester, engineer, for certain improvements in machinery or apparatus for driving piles, part or parts of which improvements are applicable also to forging and stamping metals and other substances. Sealed 24th July—6 months for inrolment.

Joseph Daniel Davidge, of Greville-street, Hatton Garden, machinist, for improvements in manufacturing certain materials as substitutes for whalebone, applicable to various useful purposes, and in the machinery for effecting the same. Sealed 24th July—6 months for inrolment.

David Napier, of York-road, Lambeth, Surrey, engineer, for improvements applicable to boilers, or apparatus for generating steam. Sealed 25th July—6 months for inrolment.

Frederic Lewis Westenhols, of 151, Regent-street, merchant, for a double-centered steam-engine,—being a communication. Sealed 25th July—6 months for inrolment.

Samuel Faulkner, of Manchester, cotton spinner, for certain improvements in the machinery or apparatus for carding cotton and other fibrous substances. Sealed 25th July—6 months for inrolment.

Edward Eyre, of Poole's Hotel, London, Gent., for certain improvements in railways, and in the machinery or apparatus employed thereon,—being a communication. Sealed 26th July —6 months for inrolment.

William Crofton Moat, of Upper Berkeley-street, Marylebone, surgeon, for a method of obtaining aerial locomotion. Sealed 26th July—6 months for inrolment.

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CELESTIAL PHENOMENA for August, 1843.

D.	H.	M.	
1			Ceres greatest Hel. Lat. N.
	15	51	♃'s second satt. will im.
2	11	27	☽ in □ or first quarter.
4	11	30	♃'s first satt. will im.
4	15	54	☿ in conj. with the ☽ diff of dec. 1. 53. S.
5			Clock before the sun, 5m. 46s.
	—		☽ rises 4h. 32m. A.
	—		☽ passes mer. 8h. 20m. A.
	—		☽ sets Morn.
	—		Occul θ Ophiuchi, im. 6h. 44m. em. 7h. 23m.
7	2	56	☿ in sup. conj. with the ☉
	12	20	☿ greatest Hel. Lat. N.
	16	58	♄ in conj. with the ☽ diff. of dec. 1. 47. S.
10			Clock before the sun, 5m. 10s.
	—		☽ rises 7h. 18m. A.
	—		☽ passes mer. Morn.
	—		☽ sets 4h. 54m. M.
	4	54	Ecliptic oppo. or ○ full moon
10	8	32	♃ in conj. with the ☽ diff. of dec. 5. 34. S.
11	13	25	♃'s first satt. will im.
12	7	44	♃'s second satt. will im.
	—		Occul k^3 Piscium, im. 9h. 35m. em. 10h. 37m.
13	13	25	♄ in conj. with the ☽ diff. of dec. 6. 24. S.
	—		Mercury R. A. 9h. 55m. dec. 14. 25. N.
	—		Venus R. A. 8h. 36m. dec. 19. 24. N.
	—		Mars R. A. 16h. 45m. dec. 26. 2. S.
	—		Vesta R. A. 11h. 56m. dec. 6. 15. N.
	—		Juno R. A. 21h. 28m. dec. 3. 42. S.
	—		Pallas R. A. 10h. 44m. dec. 6. 8. N.
	—		Ceres R. A. 11h. 14m. dec. 13. 25. S.
	—		Jupiter R. A. 21h. 42m. dec. 14. 57. S.
	—		Saturn R. A. 19h. 28m. dec. 21. 56. S.
	—		Georg. R. A. 0h. 7m. dec. 0. 0.
	—		Mercury passes mer. 0h. 30m.
	—		Venus passes mer. 23h. 12m.
	—		Mars passes mer. 7h. 20m.
	—		Jupiter passes mer. 12h. 15m.
	—		Saturn passes mer. 10h. 2m.
	—		Georg. passes mer. 14h. 40m.
15	5		☽ in Apogee
15	14	53	♃ in oppo. to the ☉
	16		Juno in oppo. to the ☉ intens. of light 1·361
15			Clock before the sun, 4m. 20s.
	—		☽ rises 8h. 42m. A.
	—		☽ passes mer. 3h. 24m. M.
	—		☽ sets 10h. 39m. M.
17			Occul 45 Piscium, im. 9h. 42m. em. 10h. 23m.
17			Vesta greatest Hel. Lat. N.
18	6	50	☽ in □ or last quarter
19	13	6	♃'s second satt. will em.
20			Clock before the sun, 3m. 16s.
	—		☽ rises 11h. 46m. A.
	—		☽ passes mer. 7h. 22m. M.
	—		☽ sets 3h. 52m. A.
	—		Occul *H* Geminorum, im. 12h. 3m.
	12	5	♃'s first satt. will im.
	—		Occul 3, Geminorum, im. 14h. 6m. em. 14h. 36m.
23			♃ in conj. with Pallas, diff. of dec. 1. 34. N.
24	11	18	♀ in conj. with the ☽ diff. of dec. 5. 24. N.
25			Clock before the sun, 2m. 2s.
	—		☽ rises 4h. 53m. M.
	—		☽ passes mer. 11h. 50m. M.
	—		☽ sets 6h. 30m. A.
	2	35	Ecliptic conj. or ● new moon
26	9		♀ in Perihelion
26	12	24	☿ in conj. with the ☽ diff. of dec. 6. 4. N.
	13	12	♃'s third satt. will em.
	15	41	♃'s second satt. will em.
27	2	19	Pallas in the ascending node
	3		☽ in Perigee
	14		♃'s first satt. will im.
29	8	29	♃'s first satt. will em.
29	15	48	☿ in conj. with Ceres, diff. of dec. 8. 12. S.
31	0	7	☿ in the descending node

J. LEWTHWAITE, Rotherhithe.

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CONJOINED SERIES.

No. CXLI.

Recent Patents.

To HENRY ROBINSON PALMER, *of Great George-street, Westminster, civil engineer, for his invention of an improvement or improvements in the construction of roofs and other parts of buildings; and also for the application of corrugated plates or sheets of metal to certain purposes, for which such sheets or plates have not heretofore been used.* —[Sealed 26th April, 1842.]

THIS invention consists in improvements on a patent granted to the present patentee on the 28th of April, 1829,* and it may be divided into two parts: the first part, viz., improvements in the construction of roofs and other parts of buildings, consists in certain methods of forming or constructing the joints or junctions of corrugated iron or metal roofs, and of connecting together iron or other metal sheets or plates for any of the purposes to which they may be applied; the joints being made in such a manner that the strength of the roof, or the particular construction of the joints thereof, may not depend upon the strength of any rivets or bolts employed

* For specification of this patent see Vol. III., page 234, Second Series.

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in forming the joints, or connecting the plates or sheets of metal together. The methods adopted by the patentee to effect this object, in many cases supersede, to a considerable extent, the use of bolts or rivets, and consequently obviate many disadvantages which arise from their use in connecting the metal plates or sheets together.

In Plate IV., are shewn several different methods of constructing or forming the joints or junctions, by which fluted, indented, or corrugated plates or sheets of metal may be connected; but although these several methods differ in some minor particulars, yet they are all constructed upon the same principle; namely, making the ends of the metal sheets or plates to abut against and thereby support each other. Fig. 1, represents a plan view of part of a roof, in which the plates or sheets abut against each other, and the joints are secured by studs or projections, made at one end of the sheets or plates; and these studs take into corresponding slits or openings, made at the end of the next sheet. Fig. 2, is an edge view of fig. 1; and fig. 3, is a side view of the same. Figs. 4, 5, and 6, represent plan, edge, and end views of part of one of the plates A, detached. It will be seen, that studs or projections *a*, *a*, are formed at one end of the plate, and slits or openings *b*, *b*, at the other end. Figs. 7, and 8, represent plan and edge views of the adjoining plate B, having similar studs or projections, and slits or openings; which slits *b*, *b*, when the two plates are brought together, pass under the flanges of the studs or projections *a*, *a*, of fig. 4, as seen in figs. 9, 10, and 11, which represent portions of the plates as joined together. Upon referring to figs. 6, and 8, it will be seen, that that end of the plate at which the slits are made is up-set or cranked, as at *c*, in order to form an abutment for the adjoining plate. The side or longitudinal junctions of the plates are formed by longitudinal bars *d*, *d*, shewn detached in side and sectional views at figs. 12, and 13. These bars have grooves *e*, *e*, formed therein, into which the sides or edges of the plates are inserted, as seen at fig. 13. That part of the groove *e*, *e*, which is intended to receive the overlapping joint, is made wider, as shewn at *e**, fig. 12; these longitudinal bars are connected together by overlapping

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joints, as shewn at *f*, fig. 12; and, if required, the bars may be made in two pieces of wrought or cast-iron, and rivetted together, as seen in fig. 14.

Figs. 15, to 22, represent another method of securing the abutting joint. In this instance the slits or openings *b*, *b*, are dispensed with, and in place of the studs or projections *a*, *a*, hook-shaped or cleft studs *g*, *g*, are employed. The end of the plate A, is up-set or cranked, to form an abutment *c*, and overlaps the plate B, as in the former instance, as shewn at figs. 21, and 22, which represent the two plates connected together. Figs. 23, 24, and 25, represent a modification of the above; the hook-shaped or cleft studs *g*, *g*, being, in this instance, formed on the under side of the plate A, as well as on the upper side of the plate B.

The patentee shews a method of applying the above improvements to form a roof. The plates, constituting the roof, abut against and are secured to the gutter-plates by means of bolts or rivets. A longitudinal bar or crown-piece runs along the crown of the roof, and forms an abutment for the upper end of each side of the roof. This bar or crown-piece has grooves formed therein, corresponding to the corrugations of the plates, which may also, if desired, be bolted thereto. In order to give greater stability to the roof, transverse bars may be rivetted or bolted to the under side of the plates.

The following figures represent various modes of securing the joints of plates or sheets, made of wrought-iron:—Fig. 26, represents a plan view, and fig. 27, a longitudinal section of one plate A. Figs. 28, and 29, represent similar views of the adjoining plate B. One end of these plates is up-set or cranked, to form the abutment, as in the plans before described; but both ends of these plates are furnished with slits or openings *b*, *b*. The abutting joints are secured by separable studs *a*, shewn detached at fig. 30. Figs. 31, 32, and 33, represent sections and plan views of the two plates A, and B, connected together, and secured by means of the separable studs *a*. The longitudinal bar *d*, may be made either of wrought or cast-iron, as in the former instance. Figs. 34, 35, and 36, represent another method of forming the abutment. Instead of up-setting or cranking one end of the plates,

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a strip of metal *l*, is brazed or soldered on the upper side, and thereby forms the abutment. Fig. 37, represents a modification of the above, in which the strip of metal *l*, is brazed or soldered on to the under side of the plate or sheet. Fig. 38, represents another method of securing the abutting joint. In this instance, the ends of the plates A, and B, abut against each other, and are subsequently secured in this position by bolting or rivetting the plate B, to a strip of metal *m*, that has been previously brazed or soldered on to the plate A. Fig. 39, represents another modification of the above. In this instance, one end of the plate A, is up-set to form the abutment for the plate B, which is secured in its place by a strip of metal *m*, previously rivetted, bolted, brazed, or soldered, to the under side of the plate A.

The patentee claims the use and application of corrugated metal plates, for the above-mentioned purposes, when the said plates are made to abut against and to support each other, as hereinbefore described.

The second part of this invention, viz., "the application of corrugated plates or sheets of metal to certain purposes for which such sheets or plates have not heretofore been generally used," consists in adapting them to the formation of arches and bridges. Fig. 40, represents the general design of a bridge, constructed of corrugated sheets or plates of cast metal; fig. 41, is a plan view of the arch; and fig. 42, is a cross section of the same. The plates *n*, *n*, are formed with flanges all round them. The end or abutting flanges *o*, *o*, connect the plates longitudinally together, by means of bolts or rivets; and the side flanges *p*, *p*, connect them transversely together in the same manner; the side flanges of the outside plate or plates being bolted to the spandrils or ribs of the bridge.

The patentee claims, in respect of the last-mentioned use and application of corrugated plates of metal, the construction of the arch by corrugated plates of metal abutting against or upon, and supporting each other, as hereinbefore described.

Another mode of applying corrugated plates consists in adapting them to railway and other wheels, in place of the spokes or arms, as shewn in fig. 43. The rims and nave may

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be cast on to the previously-prepared plate, and a tire may be added thereto in the usual way. Under this head the patentee claims the construction of wheels of such corrugated metal as hereinbefore lastly described.—[*Inrolled in the Petty Bag Office, October,* 1843.]

Specification drawn by Messrs. Newton and Son.

To NICHOLAS TROUGHTON, *of Swansea, in the County of Glamorgan, Gent., for his invention of improvements in the manufacture of zinc.*—[Sealed 22nd May, 1839.]

THIS invention relates to the application of certain arrangements of apparatus in the process of calcining or roasting zinc ore; and secondly, to the application of certain improved apparatus in the process of smelting zinc ore.

In Plate V., fig. 1, represents the section of a series of retorts for calcining zinc ores, arranged and constructed according to this invention. The retorts shewn in this figure are composed of a series of fire-tiles or parallelogram slabs. *a, a, a,* are the slabs or tiles, which constitute the bottoms of the retorts; *b, b,* are the slabs, which constitute the upper surfaces or tops of the retorts; and *c, c,* are slabs, placed vertically to produce the sides of the retorts. The back ends of the retorts are closed by similar tiles or slabs, having a hole through them for the passage of the vapours evolved from the ores; these vapours are conveyed in any direction by the flue at that end, and being thus separated from the products of combustion, may be separately acted on, according to either of the patentee's former inventions, which treat of the separated vapours of copper ores in the process of calcining or roasting such ores; or the separated products of the ore may be allowed to pass into the atmosphere. The patentee states, that by treating zinc ores in furnaces or retorts, such as are above described, considerable saving of fuel will result, and the zinc ore will be more evenly roasted or calcined.

The front ends of the retorts are closed by means of tiles or doors, having a small hole or opening in each, for the passage

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of atmospheric air; and the holes may be closed, or more or less open, according to the object required. The retorts are charged through the hoppers above, which have proper slides to close the openings into the retorts; the quantity charged into each retort being sufficient to cover the lower surface thereof, two or three inches deep. During the operation, the ore must be raked, from time to time, to change the surfaces, and the retorts should be kept to a moderate red heat.

The second part of this invention relates to an arrangement of apparatus or furnace for calcining zinc ores, wherein the ore is subjected to the direct action of the products of combustion. Fig. 2, shews a longitudinal section of the furnace, which is so constructed, that while one portion of the zinc ore is being heated in a manner similar to the working of an ordinary calcining furnace, other zinc ore is going through a preparatory process by the heat that has passed away from the ore which is undergoing the completing process of calcining. This furnace may be heated by a separate fire, to burn by blast or by draft; or the flue from the smelting furnace, may be conducted into the entrance of this furnace, and the otherwise waste heat of the smelting furnace will be thus brought into useful application for calcining or roasting of zinc ore; and this part of the invention is applicable, whether it be applied to the furnace, or to the retorts hereinbefore explained, and will be found a means of saving much fuel in the processes of obtaining zinc from ore. *a*, fig. 2, represents the furnace, which is shewn suitable for blast, and a constant supply of fuel is kept up in the chamber *b*, there being a close cover, with a sand-joint. *c*, is the bed or floor on which the ore is spread, in like manner to an ordinary reverberatory furnace; the ore is stirred about on the floor by passing the ordinary rakes or instruments through the openings *d*, *d*; and when the process has been sufficiently carried on, the ore is discharged through the openings *e*, *e*, which, at other times, remain closed by fire-tiles. The heat of the fire, and the flame thereof, passing in contact with the ore on the floor or bed *c*, also acts on the roof *f*, and that roof *f*, being hot, reverberates the heat on to the floor or bed, at the same time the heat, which passes through the roof, heats the

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ore in the upper chamber *g*; and, in addition to such heat passing through the roof, the flame and heat, from the furnace, having passed over the zinc ore, in the lower compartment of the apparatus, enters into and passes over the ore in the chamber *g*; and, in doing so, heats the roof *h*, of that chamber, and also the ore contained therein; and it will be seen, that there is a third chamber *i*; the heat therefore, which passes through the roof *h*, heats the ore in the chamber *i*. In working this arrangement of calcining furnace or apparatus, when the charge is withdrawn from the lower chamber, the charge in the chamber *g*, is to be raked into the lower chamber, through the openings for that purpose, which, at other times, are kept covered with fire-tiles, as shewn in the drawing; and the charge, in the chamber *i*, is to be raked into the chamber *g*, and a fresh supply of ore charged into the chamber *i*.

The third part of this invention relates to a mode of arranging a series of retorts, side by side, and of applying heat thereto in the process of smelting or distilling zinc from the ore. According to the practice most generally pursued in smelting zinc, the ore is submitted to the action of heat in crucibles, having descending iron pipes, which enter into vessels containing water, all which is well understood, as well as the process of smelting or distilling zinc from the ores. Fig. 3, is a side elevation of two sets of furnaces and retorts, arranged according to this invention, one of the furnaces being in section; and fig. 4, is a transverse section of the same. *a*, *a*, are a series of retorts of fire-clay, arranged, side by side, on a shelf of slabs or fire-tiles. These retorts are each closed at one end and open at the other, such open end being closed, when in operation, by a tile or door *b*, fitting closely, and luted with fire-clay, as will readily be traced in the drawing. Each series of retorts is placed in a chamber *c*, *c*, in such a manner that the heat and flame of the fire will pass from the fire-place or furnace, and act on one side of the retorts; and having passed along all the series, will proceed to the upper part of the chamber *c*, *c*, and heat the other side of the retorts; and as the fires are maintained and urged by means of blasts of atmospheric air, the heat may be maintained and

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regulated with great advantage, and at comparatively small cost. The blasts of air may be produced by any ordinary blowing machinery, but rotatory blowers are preferred, and the air may be cold or heated. When anthracite coal is used as the fuel, the patentee prefers adopting the hot blast, at a temperature of at least 500° of Fahrenheit, and such heating may be performed by any of the well-known means now very generally resorted to for heating the blasts of air for smelting iron. *d, d,* are iron pipes, descending from the retorts and entering into vessels containing water, similar to the apparatus at present in use for like purposes. Each chamber *c,* is heated by its separate furnace or fire-place, which have openings, to be closed when at work; and in order to keep up a supply of fuel to the fire, each fire-place has an inclined chamber *e,* which is filled with fuel, and then closed air-tight by the cover *f,* fitting into a sand-bath or joint, in order to prevent draught upwards. By this means the lower portion only of the fuel will be in an ignited state when at work. *g, g,* are a series of iron doors, one opposite the mouth of each retort; these doors are capable of being removed by sliding them upwards, till the portions cut out at the sides come opposite the dips or holders *h, h,* when the doors may be removed, in order to get at the retorts. *i,* is a chamber in which the ore is heated previous to its being placed in the retorts. The arrangement of the brick-work, the construction and the setting of the furnaces, being clearly shewn in the drawing, no further description need be given.

The patentee remarks, that he is aware attempts have been made to employ retorts in the smelting of zinc, and he does not, therefore, claim the same generally; but he does claim, in respect to the third part of this invention, the mode of placing a series of retorts in a chamber *c,* and causing the heat and flame to pass along, under and over, such series of retorts, as above described; and he also claims the mode of smelting zinc by means of blast, whether the heat of the fuel is caused to act on a series of retorts or vessels, in the manner shewn, or on other arrangements of retorts or vessels, placed in a suitable chamber or chambers.—[*Inrolled in the Inrolment Office, November,* 1839.]

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To JOHN PETER BOOTH, *of the City of Cork, merchant, for certain improvements in machinery and apparatus for working in mines, which are applicable to raising, lowering, and transporting, heavy bodies; and also affording assistance in promoting a more perfect ventilation of the mine.*—[Sealed 9th July, 1842.]

THESE improvements in machinery and apparatus for working in mines, which are applicable to raising, lowering, and transporting of heavy bodies; and also in affording assistance in promoting a more perfect ventilation of the mine, consist, Firstly,—in the means of raising and lowering heavy bodies in the shafts of mines and other situations, by which any ill consequences from the accidental breakage of the suspension rope or chain will be prevented, and the weight arrested in its descent. Secondly,—in the adaptation or application of the mechanical power for raising heavy bodies from a mine or other situation, through the agency of a revolving screw-shaft, or a consecutive arrangement of revolving inclined planes, the surfaces of which are made to act against the peripheries of rollers or other projections, extending from the car or carriage in which the heavy body, intended to be raised, is placed; and Thirdly,—in the employment of power, derived from the revolving-shaft, to the purpose of working a rotary fan, or other air-pump apparatus, for injecting pure air into, or abstracting foul air from, mines, during the operation of working them, in order to assist the ventilation.

In Plate V., fig. 1, represents the section of a shaft of a mine, taken vertically with two cars or boxes A, and B, the former ascending, the latter descending. To the sides of the shaft there are affixed, by brackets or other fastenings, vertical bars of iron *a*, *a*, *a*; and on the face of each of these bars a rack or series of ratchet-teeth are formed. The car or box A, or B, is confined to the perpendicular bar *a*, by sockets *b*, *b*, affixed to the upper and lower parts of the box, which sockets clip the perpendicular bar, as shewn in the detached horizontal section, drawn upon an enlarged scale, at fig. 2. It will thus be perceived that the boxes A, and B, slide up

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and down the shaft of the mine upon these notched or rack-bars *a*, *a*. The cars or boxes, within which are the platforms, are suspended by a rope or chain *c*, *c*, *c*, attached by a brace *d*, to the upper part of the box; and the rope or chain is passed over guide-pullies *d**, *d**, to a drum-wheel above, the rotation of which drum raises or lowers the car in the usual way. Upon the upper socket *b*, the fulcrum of a lever *e*, is fixed, the longer arm of which lever is held up by a chain attached to it and to the suspension-rope or chain *c*; and to this lever is also attached a chain, which suspends the platform within the box. In the event of the suspension-rope breaking, as shewn at B, the longer arm of the lever *e*, will fall, and the shorter arm or point of the lever be thereby projected into the rack of the perpendicular bar, which will consequently cause the descent of the car or box to be arrested and held firmly in that situation. In order to bring this lever *e*, instantaneously into operation, on the suspension-rope breaking, a small auxiliary rope *g*, is attached to the shorter arm of the lever, which rope is continued by the side of the suspension-rope to the drawing-drum. Hence, the moment that the suspension-rope breaks, the small rope *g*, holds up the shorter arm of the lever, and brings its end into the rack of the perpendicular bar, by which the car or box, with its platforms, are supported. As the portion of the broken rope or chain, connected to the car, may be of considerable weight, it will be necessary to provide a guard above, to prevent its falling injuriously, upon the platform in the car or box. For this purpose a jointed frame is constructed, as shewn at *h*, *h*, in the detached figures 2, 3, and 4, in order to constitute a roof; it is formed of rods, connected together by a frame, having a hinge-joint in the middle, and is supported by perpendicular standards *i*, *i*, on the top of the box. These standards have slots, in which the ends of the frame are inserted; and when the weight of the falling broken rope comes down upon the roof, its angular figure is expanded, and the ends of the frame are projected outwards against the sides of the shaft.

Fig. 5, is a vertical section of the shaft of a mine, in which two perpendicular rods or screw-shafts *a*, *a*, *a*, are mounted,

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and held by staples or bearings *b*, *b*. The worm, upon these screw-shafts may be of any required obliquity, or a consecutive arrangement of inclined planes may be affixed to the shaft, in place of the continuous screw or worm-thread. A, and B, are the boxes or cars to contain the heavy bodies intended to be raised or lowered. To each of these cars two or more anti-friction wheels *c*, and *d*, are attached, turning on axles in brackets, affixed to the upper and lower parts of the boxes. These wheels run in the groove or recess of the screw, and as the screw-shaft revolves necessarily raise or lower the box. On the sides of the pit or shaft of the mine, parallel guide-rails *e*, *e*, are affixed, against which certain wheels or anti-friction rollers *f*, *f*, attached to the box or car, are intended to work, for the purpose of keeping the rollers *c*, and *d*, continually in the thread or recess of the screw-shaft, as shewn in the horizontal section, upon an enlarged scale, at fig. 6; hence, by giving rotary motion to the screw-shafts, in any convenient way, the boxes or cars will be raised or lowered in the pit. For the purpose of allowing the bearings or supports *b*, *b*, to embrace the shafts, small portions of the thread of the screw are cut away, and also a groove made round the screw-shaft to receive the strap of the bearing, as represented in the enlarged detached views of a portion of the screw-shaft, at figs. 7, 8, and 9. By this arrangement, one, at least, of the rollers will always be in contact with the revolving screw-thread, or inclined planes, and thereby prevent any interruption to the progress of the car, which might otherwise occur, as the wheels successively pass over the open parts of the thread. At the lower end of one of the perpendicular screw-shafts, in fig. 5, a bevil-wheel *g*, is affixed, which takes into a corresponding wheel *h*, upon the axle of a pulley, carrying a band *i*, *i*, which communicates with and drives the rotary fan of the blowing apparatus *k*; or it might be applied to any other machinery, capable of forcing air for ventilating the lower part of the mine.

The patentee claims the apparatus for arresting the descent of the car or box, in the event of the suspension-rope or chain breaking, as above described; the employment of the screw-shafts, or rotary inclined planes, for working the carriage,

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and the mode of supporting them, and of enabling some of the rollers of the car to keep continually in contact with the surface of the screw, whilst others are passing over the open parts of the thread, by the means above described; and the derivation of the power for working the ventilating apparatus, from the rotation of the screw-shaft.—[*Inrolled in the Petty Bag Office, January*, 1843.]

Specification drawn by Messrs. Newton and Son.

To WILLIAM OXLEY ENGLISH, *of Kingston-upon-Hull, distiller, for improvements in purifying spirits of turpentine, spirits of tar, and naphtha,—being partly a communication.*—[Sealed 8th December 1842.]

THIS invention consists in an improved method of purifying the unrectified spirits of turpentine, tar, and naphtha, whether the unrectified spirits of turpentine may have been obtained from distilling turpentine alone or with water. The process is as follows:—The spirit to be purified is put into a close vessel, and a pipe, in connection with a steam-boiler, is attached thereto, in order to introduce steam below the liquid under process, which, rising up through the liquid, carries vapour therewith. From the upper part of this vessel a pipe communicates with the lower part of a second vessel; and from the upper part of this second vessel a pipe communicates with the lower part of a third vessel, and so on for any number of vessels which may be found convenient. The patentee uses four vessels, but a greater number are preferred. The spirit which is to be purified is placed in the first of these vessels, either alone or mixed with water; and in some or all of the others is placed water, mixed either with potassa, quick-lime, soap leys, or any other alkali or alkaline substance, or else with sulphuric or some other acid; and in those vessels not containing such mixture, pure water is placed. The mouth of the pipe, opening into the bottom of each vessel, must be below the liquid contained in that vessel; and at the lower extremity of each pipe is a bulk, pierced with holes; and each of these pipes should be in connexion with the steam-

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boiler, so that free steam may pass through the liquid in each vessel; and the mouth of the pipe, opening into the top of the vessel, must be above the contents; and part of each pipe must be so elevated that the liquid in one vessel shall not flow into another. In place of the steam-pipes, heat may be applied to the vessel in which the spirit is contained, so as to drive the spirit over in vapour, which will pass along the pipes into the successive vessels, and through the liquid contained in them. The temperature of the liquids, contained in the several vessels, may thus be kept above the condensing point of the vapour, either by the heat of the vapour itself or by external heat, applied to the several vessels. The vapour from the last of these vessels is conducted to a condenser, and condensed in the ordinary or any other method. The spirit is thus purified by the chemical action of the acid or alkali, through which it is driven in a state of vapour, as well as by the mechanical action of the water, after the spirit has been condensed; and it may be further purified by filtering through lime, or any other alkaline or acid substance.

The patentee claims the method of purifying the spirits above mentioned, by causing them to pass, in a state of vapour, through an acid, or alkaline, liquid, or through water; and also the method of purifying the spirits above mentioned, (by causing them to pass, in a state of vapour, through a succession of several vessels,) by steam or other heat; and likewise the method of purifying the spirits above mentioned, by causing them to filter through an acid, or alkaline, substance; but he does not claim rectifying the spirits above mentioned, by re-distilling them with water alone, or causing them to pass, in a state of vapour, through water in one still. —[*Inrolled in the Inrolment Office, June,* 1843.]

To James Stewart, *of Osnaburgh-street, Regent's Park, piano-forte maker, for an improvement in the construction of castors.*—[Sealed 16th December, 1841.]

This invention consists in a peculiar construction of castor, whereby a greater degree of strength, stability, and freedom

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of action, is designed to be obtained. In Plate IV., fig. 1, represents a front view of a socket castor, constructed according to the present improvement; and fig. 2, is a section of the same. *a*, is the socket or cup, by which the castor is attached to the furniture; and from the bottom of this cup proceeds upwards the tube *b*, which is plugged at the top, and forms a bearing for the pointed end of the spindle *c*, to work against. This spindle is retained in the tube *b*, by a pin or screw *e*; and to its other end the horns or horned piece *d*, is firmly attached, which carries the ordinary roller *f*;—*g*, is a friction-roller, mounted on a pin, and turning in a space cut out of the horned piece *d*, for the purpose of working against the under surface of the socket.

Fig. 3, shews a similar arrangement applied to a plate castor, in which the tube *b*, is attached to a plate instead of a socket, as in the former instance; the other parts being the same, no further description will be necessary. By this improved castor, the patentee states, that full effect will be given to the leverage of the horns *d*, and the spindle *c*, will be prevented from bending or yielding to the strains of heavy weights. He claims the particular combination, above described, of the spindle *c*, the horns *d*, and the friction-roller *g*, intermediate, in its position, between the spindle and the axis of the ordinary roller, in the construction of a castor for furniture.—[*Inrolled in the Inrolment Office, June*, 1842.]

To JOHN VARLEY, *of Colne, in the County of Lancaster, engineer, and* EDMONDSON VARLEY, *of the same place, cotton manufacturer, for certain improvements in steam-engines.*—[Sealed 28th April, 1842.]

THESE improvements in steam-engines consist in the application of certain novel mechanism or apparatus, to be substituted in place of the ordinary excentrics or cranks, commonly attached to or used in connection with the main or crank-shaft of steam-engines, for the purpose of working the D, or other slide-valves, to regulate the admission and exit of steam to and from the cylinders.

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The object of the improvements is to enable the steam, employed in working steam-engines, to be worked expansively and compressively, and thus to economize the consumption of fuel; and also to effect an increase of power, by the introduction or application of a simple arrangement of apparatus, which shall cause the steam to be quickly admitted to the cylinder, and cut off therefrom, at any required angle of the crank, during its revolution, by means of the suitable action of such apparatus upon the ordinary D, or other slide-valves, commonly used for regulating the admission of steam to the cylinder of the engines.

In Plate IV., fig. 1, represents an elevation of a condensing steam-engine, with these improvements, represented attached thereto; and fig. 2, is a view of the apparatus, drawn detached, and upon an enlarged scale, but with some slight modification in the application thereof. *a*, is the main or crank-shaft of the steam-engine; *b*, *c*, is a tappet or tumbler, fixed upon the crank-shaft, and substituted in place of the ordinary excentric; and *d*, *e*, is a cam, substituted in place of the ring surrounding the ordinary excentric. To the cam *d*, *e*, horizontal slides *f*, *f*, are attached, or made in one piece with the cam, having V edges, and sliding to and fro in brasses or steps, mounted in the standards *g*, *g*. The cam *d*, *e*, may be attached to the ordinary excentric-rod, or slide-valve rod *h*, *h*, by means of bolts and nuts, as in common, and shewn in fig. 1; or by being jointed to the end of the sliding-piece *f*, as shewn in fig. 2. It will be evident, that as the crank-shaft *a*, revolves in the direction of the arrow, the first rise or lift *b*, upon the tappet or tumbler, will act against the surface *d*, upon the interior of the cam, and thus shift the cam, and with it the excentric-rod *h*, *h*, to the left-hand, which movement will effect the cutting off of the steam in the slide-valves at the quarter-stroke, or any other given point; and as the tappet continues the revolution, the second or extreme rise *c*, upon the tappet, will now act upon the surface *d*, and shift the cam, and with it the excentric-rod, as shewn by dotted lines in fig. 2, and, consequently, open the slide-valve port, to the full extent, for the admission of steam. The completion of the revolution of the crank-shaft will cause

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the double tappet *b*, *c*, to act upon the other surface *e*, of the cam, and consequently reverse the action of the valves. Thus it will be understood, that by this apparatus the valves receive a double or interrupted motion instead of the regular motion, caused by the ordinary excentrics; namely, two strokes for opening the ports of the slide-valves into the cylinder, and two for closing the same at each revolution of the crank-shaft. The first stroke of the tappet closes the induction port, shuts off the steam, and causes that which is confined in the cylinder to work expansively; leaving the eduction port partially open, until the piston has moved a little farther, when the eduction port becomes closed, and the steam which remains uncondensed in the cylinder, becomes compressed therein, nearly to the extremity of the stroke of the piston, or until the second stroke of the tappet opens the contrary induction port, at which time, the compressed steam in the cylinder and newly admitted steam meet together, and form a counterbalance and re-action in the return stroke of the piston; the eduction port being opened a little prior to the induction port. It will be seen, that these two strokes of the tappet take place in one-half of a revolution of the main or crank-shaft, and are again repeated in the other half of the revolution, admitting and cutting off the steam, at any required angle of the crank, in each entire revolution.

At fig. 2, it will be seen, that the double tappet or tumbler *b*, *c*, may be (if preferred) made in two parts, for the purpose of regulating any adjustment of the striking points required; and it will also be evident to the practical mechanic, that the double tappet or tumbler may be applied to any shaft employed for the purpose of communicating motion to the slide-valves.

The patentees claim the substitution and employment of a double tappet or tumbler, in connection with the internal cam and excentric or valve-rod, (instead of the ordinary excentric motion,) for the purpose of working the D, or slide-valves, in order that engines, so constructed, may be enabled to work the steam expansively and compressively.—[*Inrolled in the Petty Bag Office, October*, 1842.]

Specification drawn by Messrs. Newton and Son.

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To JOHN WOODCOCK, *of Manchester, in the County of Lancaster, millwright, for certain improvements in the construction of steam-engines.*—[Sealed 7th June, 1842.]

THESE improvements in the construction of steam-engines apply, Firstly,—to that class termed rotary engines. Secondly,—to the slide or steam-valve and chamber, whether used in condensing or high-pressure engines; and Thirdly,—to the stop-valve used for the purpose of shutting off the steam between the boiler and the engine.

The improvements in rotary engines are exhibited at figs. 1, and 2, in Plate VI.; fig. 1, being a partial sectional elevation of the same, one of the side-plates being removed, in order to shew the internal construction; and fig. 2, a transverse or cross section, taken through about the middle of the engine. *a*, *a*, is an outer cylinder or casing, which encloses the inner cylinder *b*, *b*, placed excentrieally within it, and mounted upon a shaft *c*, which passes through stuffing-boxes *d*, *d*, attached to the side-plates *e*, *e*, which enclose the outer cylinder *a*; this inner cylinder is divided by four sliding pistons *f*, *f*, coupled together in pairs, by means of the links *g*, *g*. Steam-ways or passages *h*, *h*, are provided in the outer cylinder, having diagonal apertures or openings *i*, *i*, (as seen in fig. 2,) for the passage of the steam to and from the cylinder *a*. On steam being admitted from the valve-box *k*, by means of the pipe *l*, it will immediately exert its pressure against the piston f^1, thus driving the inner cylinder round, and escaping through the exhaust-pipe *m*. It will be observed, that the pistons f^1, and f^2, are connected, by means of the link g^1; and that the pistons f^3, and f^4, are connected, by means of the link g^2, and thus they will be slidden in and out as required, by the revolution of the cylinder *b*; the inner cylinder being made to work close up to the inner surface of the outer cylinder, and packed with a rib of brass or other metal, to prevent the escape of steam. A small groove *o*, *o*, is turned about a quarter of an inch deep in the outer cylinder, extending from the steam-ways to the packing at top, as shewn by dotted lines, in fig. 1, for the purpose of allowing a

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small portion of the steam to escape at the packed end of the piston.

It will be seen, in fig. 2, that rings of brass or other metal are placed in grooves, turned in the outer plates, to act as a packing between the outer plates and the sides of the cylinder, and keeping the whole perfectly steam-tight; the outer ends of the pistons *f, f,* are also to be similarly furnished with metallic packing. An ordinary slide-valve *q,* is provided, whenever it is required, to reverse the action of the engine; and in large engines, six or eight pistons may be employed. The links g^1, and g^2, for connecting the pistons, are constructed with open mortices, so that they shall act exactly the same as if they were passed through the shaft of the inner cylinder, without the objection of weakening that shaft.

The improvements which refer to the steam-chamber and slide-valves of steam-engines, are represented at the sectional figs. 3, and 4, which exhibit the slide-valve and its seating, with the steam-ports or ways opening into the cylinder. The steam cylinder *a, a,* has four apertures or passages for the steam, *b, b,* and *c, c,*—two for the induction, and two for the eduction; those for the induction are to be in proportion to the diameter of the cylinder, according to the ordinary calculation; and those for the eduction *c, c,* to be as one and a half is to one of the induction in area, or any other proportion, if preferred. The slide-valve *d,* is so constructed as to open and shut all the four apertures; and is also provided with a fifth aperture *e,* for the exhausted steam which escapes at the pipe *f,* between the cylinder and face-plate. The slide-valve *d, d,* is to be worked from the crank-shaft, as in common, opening and closing the apertures *b,* and *e,* alternately. The steam cylinder may have six or more apertures; and supposing it is required to have the apertures for the eduction of the steam, double the width of the induction, the eduction may be divided into two apertures, top and bottom, placing the apertures for the induction in the centre, and introducing all the spent steam from the eduction apertures into the hollow part of the slide-valve; it will escape, by another aperture, into a pipe, conducting it to the condenser, or open air, in the same manner as when only four apertures are used. There

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are also small spaces *g*, *g*, between the slide-valve and cylinder facing, for the passage of steam, in order to reduce the friction, by thus relieving the valve from the outer pressure of the steam. This arrangement of the slide-valve is particularly intended for stationary engines, where the load is continually fluctuating, by the machinery being often thrown in and out of gear; and also for marine engines, where the full force of the steam is frequently required.

The third improvement, which relates to the stop-valve, to be employed between the boiler and engine, is shewn at figs. 5, and 6,—fig. 5, being a face view of the valve, and fig. 6, a cross section of the same. This valve may be employed for the purpose of closing the communication for the passage of steam between the boiler and the engine, or in the various processes of dyeing, bleaching, or printing; and in all situations where a great quantity of steam or water is required; and, by applying a spout, it may also be converted into a stop-cock. *a*, is a short pipe with flange, for the entrance; and *b*, a similar pipe and flange, for the exit. A slide or door *c*, for stopping the passage, has a groove *d*, *d*, formed in the upper part, in which an excentric *e*, is caused to work; and thus, by partially turning the handle *f*, fixed upon the outer end of the shaft *g*, of the excentric, the slide is opened or closed, as required. A stuffing-box *h*, *h*, is provided, for the purpose of making the whole steam-tight.

The patentee claims the novel constructions and arrangements above described.—[*Inrolled in the Petty Bag Office, December*, 1842.]

Specification drawn by Messrs. Newton and Son.

To George John Newbery, *of Cripplegate-buildings, in the City of London, artist, for his invention of certain improvements in producing damask and other surfaces on leather and other fibrous substances.*—[Sealed 18th August, 1842.]

The patentee first describes his improved method of producing damask surfaces on leather and other fibrous substances and

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fabrics. The process is as follows:—A mould or matrix is obtained, with the pattern sunk in relief, and forming the counter-part of the surface desired to be produced; this mould may be formed of engraved metal or wood, or other suitable material, or by making a cast from the article to be copied in plaster of Paris; but, where the nature of the work will allow of it, the method preferred is to spread a coat of dissolved gelatine or isinglass over the model, which has previously been slightly brushed over with a little wax, dissolved in turpentine. After the gelatine has become dry, it is stripped off from the figured damask surface, the thin coating of wax allowing it to come away easily; and thus a gelatine mould, of great sharpness and perfection of pattern, is obtained. When it is desired that the gelatine mould shall be made additionally strong, a fine muslin or other thin texture may be spread over the whole of the surface, before it is dry or even set; and this texture, becoming imbedded in the gelatine, will give greater cohesion and strength to the mould. On the face of this mould a thin coat of copal or other oil, or spirit varnish, is laid, with a brush or other convenient tool; and when the varnish is dry, it is further coated with oil paint, of any color desired; or a pigment, mixed with any other suitable medium, as resinous gums, japans, or varnishes, may be applied; and after covering every part of the face of the mould in this way, by one or more coats of color, when dry, a coating of adhesive varnish, commonly called "flocker's varnish," is given; and while this remains sticky, the patentee spreads over the whole of the surface a layer of leather, (split skins and skivers are preferred,) or, as may suit the purpose, woven cotton or other fibrous fabric, which is pressed down into close contact with the painted surface, and when made to adhere, it is allowed to dry.

The patentee does not confine himself to the use of flocker's varnish, as many other adhesive matters may answer perhaps equally well, and for some purposes better; for example,—a solution of common glue may be preferred, when pliability is not required; but a solution of caoutchouc will be preferable when increased pliability is the object. The whole being dry and consistent, the last part of the process is to dissolve the

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gelatine which formed the mould, and remove it from the surface by washing it clean away with a sponge and warm water; and this leaves a substance of paint, the fac-simile of the woven damask pattern, from which the mould of gelatine was first obtained; and, as a raised surface, the pattern is now fixed upon the leather or other fibrous substance. When the mould or matrix is made of metal, wood, &c., as before mentioned, a thin coat of wax is first applied to the face of the mould, and then a thin solution of gelatine is poured thereon, which, when dry, will coat the surface of the matrix with so thin a stratum, that hardly any perceptible loss will be discovered in the sharpness of the pattern, after the process of painting and backing is carried out upon this prepared metal mould. When all is dry, the fabric is stripped from the mould, and the small portion of gelatine, which will be found to adhere to the surface, is washed away.

It will be obvious, that there are many other embossed or indented surfaces, which may as easily be produced on fibrous substances, by the same process, as the "damask," which is also an indented surface; and indeed the process is susceptible of imitating the most prominent basso-relievo. This process is also adapted for imitating the corrugated appearance of the grain of morocco leather, and in transferring the surface to the surfaces of cotton fabrics and other fibrous substances. In effecting this object, the surface of the morocco grain of the leather is slightly waxed, and the gelatine counter-part, or matrix, is obtained in the way already described; and the remainder of the process is similar to that shewn in producing damask surfaces. When it is required to produce a pattern on the uneven and corrugated surface of the morocco, to resemble parts dyed with other colors, the design of the pattern is painted, in its proper colors, upon the face of the mould; and, when dry, the whole surface is coated with another color, to form the ground; the finish is then given, as before described.

The next part of the invention is to produce level flat surfaces, and also embossed and indented surfaces on various fibrous textures, by a method already in part recited; and in addition, to give them, in some instances, painted and printed

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surfaces, so that when such surfaces are backed and imbedded with fibrous textures, as thin cambric muslin, they shall be suitable for window blinds and transparent screens. For this purpose, a metallic or other surface, either plain, like plate-glass, or engraved and hollowed out into a pattern, is first slightly waxed, and while in a horizontal position, a layer of gelatine, in solution, is spread over it. Some fibrous woven texture, such as cambric muslin, strained on a frame, is then imbedded in the solution of gelatine, and when dry, it is to be stripped off. By these means, there will be presented a beautifully smooth surface, suitable for a blind, without further process, fit to be painted upon by an artist, in the ordinary way. Instead of producing a plain transparent even surface on the texture, the process may be varied by making use of transparent paint, mixed with gelatine as a vehicle, with which a design may be painted or printed on the even surface; and when dry, it should be coated with clear, plain, or stained gelatine, so as to form the ground stiffening, and the finishing may then be proceeded with.

By sinking patterns in the matrix, in the way already described, and filling such devices with color, mixed with gelatine, and afterwards, when dry, spreading a coating of pure or clear gelatine over the whole surface, and attaching the fibrous texture thereto, devices may be formed on the blind or screen, in imitation of cameos, in transparencies or opaque; the various depths of the matrix pattern, giving its effects of light and shade, by the greater or less substance of color. By the same means also, that is to say, a flat polished surface and the process described, those light and delicate gauzes, laces, and woven fabrics, which would not bear the brush in the ordinary process of sizing, may be made to present a perfectly glazed surface, not otherwise to be produced, in consequence of the open nature of the woven texture. By a similar process, a very flat surface is stiffened and produced upon various fibrous substances, such as gauzes used to stiffen bonnets, by preparing the same, in the way described on flat surfaces, with thin glue, or other convenient vehicle. Paper drawings, prints, paintings, maps, and oil pictures, may also be mounted, by fastening the same face downwards on an

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even waxed metallic or other surface, and thickening the same up by other sheets of paper, or by fibrous woven fabrics or leather. Sometimes it is found more convenient to put the strengthening material first on the polished waxed surface, and afterwards the print, drawing, or painting.

Another part of this invention of producing surfaces on leather and other fibrous substances, relates to methods of producing embossed surfaces on such substances as have been already described, and bringing the leather, or other fibrous substance, into high or low relief. This part of the invention is effected in either of two ways; the first is by the application of hydraulic pressure, the other by the effect of vacuum. In proceeding upon the first plan, viz., hydraulic pressure, a cylinder or case is provided, the diameter of which is sufficient to receive the mould or matrix intended to impart the required figure to the leather or other substance. On the bottom of the cylinder, which is formed of a plate of iron, made to screw firmly into the cylinder, and which has small perforations, to allow the air to escape, the mould is placed; and upon the mould, or within it, as the case may be, a sheet of leather, or pelt, or half prepared leather, is placed. This leather must be well wetted, either in one piece, when the subject is only a basso-relievo, or joined up in several pieces for bold relief, by India-rubber glue, to a shape something approaching the form it is ultimately intended to take; and further up in the cylinder there is placed a strong sheet of India-rubber, forming a sort of drum-head, and covering the entire area of the circle; and this is secured to the interior of the cylinder by a solution of caoutchouc, so as to line the sides of the cylinder five or six inches above this drum-head. The upper part of the cylinder is made hemispherical, for strength, and at its top a pipe is inserted, which is to be connected with the interior of the cylinder of one of Bramah's hydraulic presses; the cylinder, containing the mould, is now filled with water, in the part above the drum-head; and being connected to the hydraulic press by its pipe, on pumping in the usual way, the sheet of rubber, forming the drum-head, will be depressed, and forced down upon the mould, driving before it the leather into all the various shapes of the

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pattern; the air escaping through the perforations of the bottom. In order to know how the operation proceeds, from time to time, the bottom of the case must be removed, and the work adjusted and assisted, and again submitted to the pressure, until complete. These surfaces, so formed, may afterwards be thickened by other textures, forced on them, and the whole may be tanned, painted, or saturated with color or oil, or japaned with resinous matters, so as to be made impervious, and capable of bearing aqueous liquors.

Another process for obtaining ornaments in relief on shapes of leather, as cups, &c., is to employ a vacuum. To effect this, at the top of a vessel, from which the air is to be extracted, a strong perforated cover is placed, and over this a mould, formed of some porous substance, as oak-wood, which is very open and pervious in the grain; this mould is cut and engraved into a die or pattern, upon a transverse cutting of the wood; or, if preferred, metal dies or patterns may be used, with perforations in every depth, through which the air may be extracted. Having placed this over and upon the upper surface of the close vessel, and secured it well at the edges by a cement of caoutchouc or other suitable matter, the leather is then laid on the mould in a wet state, it having been rolled and beaten, so as to increase its thickness, at the expense of its area; the air is now exhausted from the lower part or interior of the vessel, which communicates with the upper surface of the die or matrix beneath the leather, &c.; the substance is thus drawn down into the hollows of the die or matrix, and it may be further assisted by wetting and working it in above with modelling tools; if necessary, a thin sheet of caoutchouc may be put over the fibrous substance, to render it more completely air-tight, and the vacuum more effective. When dry, the leather is removed, and, if desired, its hollows may be filled with plaster of Paris, in order to keep it in proper form. This embossed surface on leather and other fibrous textures, produced by these means, may afterwards be thickened by other layers, or saturated with glue and resins, or gums, or varnishes, and rendered water-tight, or tanned, to render it durable.

Another surface the patentee produces, on fibrous textures,

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is a perforated surface, applicable to blinds for windows and screens, the perforations being produced from pinned and coppered blocks, resembling those used by silk handkerchief printers and paper stainers. The fibrous textures preferred, for forming these perforated surfaces upon, are fine-sized cambric, leather, and paper. These textures are to be strained on a frame, perfectly tight; the pattern-block is to be put under the sheet of texture, with the ornamental pinned face uppermost, and exactly in that part of the texture intended to be perforated. The surfaces of the texture and the pattern being brought in contact, a piece of fine glass paper is covered over a flat cork, and by friction over the block on the texture, and pressure with the glass paper, the texture will be worn into holes of the required form of the design. The block is then to be shifted to any other part of the texture, and the operation repeated, until the whole design is formed.

Another improvement in producing surfaces on fibrous textures, is to burnish or hand-calender cotton, silk, linen, and other textures, (save and except leather which has been done before,) upon a table or block that has a design cut upon its surface, similar to a paper-stainer's pattern; such process is called damasking, on leather, and is used for table, piano, and other covers. The woven fabric, such as cotton, &c., is to be slightly damped, and placed on the face of the print or pattern-table, and its outer surface passed all over with the burnisher; when those parts of the pattern, that stand up like the face of a type, will have caused the texture to receive a high polish, which will form a pleasing contrast with the unburnished ground-work. The same process, applied to silks, will be found suitable for parts of ladies' dresses. By a damasking-table, or indeed any other pattern-block, of a similar nature, there may be produced on leather, and other fibrous substances, and woven textures, figures in gold, and burnished and embossed colors. The pattern-block may be of wood, or metal, or any hard substance. The surface of the pattern-block is waxed, and a roller, charged with isinglass or albumen, mixed with or without color, passed over it; if to be gilt, the color is dispensed with, and in that case the gold-leaf is laid on the prepared surface of the block, so as to

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gild it. When dry, isinglass is again passed over the pattern block, and before that is quite dry, the fabric is laid thereon. After a time, sufficient to allow it to become partially dry, a hot burnisher, or hot roller, about the heat of a gilding-tool, is passed, with pressure, over the surface in all directions, when, on stripping off the fabric, the gold or color, as the case may be, will be found to have left the surface of the pattern-block, and have become firmly cemented to the texture. Thus large surfaces may be gilt without metal tools, and more perfectly than by the ordinary process; in some cases the surface of the pattern-block is hollowed out, so as to produce basso-relievo figures on the fabric; but when this is done, following-blocks or small burnishers must be used, to force the texture into those hollows.

Another improved surface is produced, by passing black crape through boiled oil, or other siccative oil, or spirit varnish; and afterwards pressing it through a padding-mill, to remove all superfluous oil, &c., leaving sufficient to form a coating upon each fibre of the texture, to protect it from the effect of damp or rain, and causing it to retain its figure and beauty longer than it would otherwise do.

To produce a surface, on a fibrous texture, from an engraved design or plate, the patentee pours a melted solution of isinglass over the surface of the engraved plate, which has been previously inked, and while the isinglass is soft, he applies a sheet of paper, or woven fibrous texture, or leather, to the plate; when dry, the paper or other texture is stripped up from the plate, and it will be found to have received a beautiful impression. By this process, impressions of any magnitude, such as maps, may be obtained without a join, and without the use of a press.

Another improved mode of producing surfaces on fibrous substances and leather, is by printing from the pores of various woods and metals, and natural substances, as marbles and crystals. This is done by rubbing ink into the natural grain and printing it off, by the letter-press or copper-plate presses; by this method, either with or without the aid of electrotype, beautiful impressions of transverse cuttings of woods may be obtained for the use of the microscope.

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Another improvement on surfaces of fibrous substances, is effected by casting paper pulp into moulds of plaster of Paris, or other suitable substance, which moulds must be sunk to a pattern and hollowed out, so that where the greatest depths of shadow are required, proportionate depths shall be made in the mould, and where the strongest lights are required, proportionate shallows in the mould shall be left; then, by waxing the mould slightly, and filling it with paper pulp and gelatine, when dry, on stripping it out of the mould and holding it up before the light, effects will be produced of figures and ornaments in transparent shadows, resembling the French china lamp shades, called "lithophraimiques," but capable of being made into larger surfaces, and not so liable to break or injure. The process is also applicable to window blinds and screens, and many other useful purposes.

Copies from paintings of the old masters are produced on fibrous textures by the following method:—First, trace parts of the original design on glass, or some perfectly level metallic or other substance, (perhaps a flexible surface will be best,) then fill up certain parts of the design to the outlines, with colored or stained wax, which is to be semi-transparent; this wax must be scraped and modelled into as close a resemblance as possible of the folds of the drapery or other parts of the design to be imitated; and when perfect, make a mould of gelatine upon this form of wax; when dry, strip it off the metallic or glass surface, and take the wax model out of the mould, and fill the hollows with color of the appearance of the original picture, and allow it to dry; and when dry, transfer it on to a canvas or other fibrous substance, and proceed in a similar way with as many other parts of the painting as are suitable to the purpose; the picture will then require a competent artist to fill up the deficiencies.

Another method in producing surfaces on leather and other fibrous substances, is to form imitations of marble on such substances. This is done by sprinkling liquid colors, mixed with varnish and soap, thinned with spirits, (according to the tints and forms in the marble desired to be imitated,) on the surface of a sheet of water, where they are to be formed,

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agreeably to the taste of the artist. When this has been done, the paper, or other substance, intended to receive the impression, is to be carefully laid down upon the water surface, and the paper, being absorbent, will then receive the pattern of the marble on its surface.

When surfaces, resembling mosaic and other inlaid patterns in colored marbles, are required to be produced upon fibrous substances, an outline of tin or other material is immersed in the water, so that the various parts of the design are kept separate from the ground pattern; and, by placing the paper on the surface, the impression of both figure and ground is obtained at once.—[*Inrolled in the Petty Bag Office, February,* 1843.]

To WILLIAM CHESTERMAN, *of Burford, Oxford, Gent., for improvements in filtering liquids.*—[Sealed 23rd June, 1841.]

THIS invention consists in an improved construction of vessel, for making decoctions of coffee and other matters therein, and filtering the same when made.

In Plate VI., is a figure representing the vessel inverted and in section. *a*, *a*, is the outer casing, which may be made of tin or other suitable material; *b*, is a tube, affixed to the bottom *c*, of the vessel, for the purpose of holding an iron heater *d*;—*e*, is the mouth of the vessel, formed of a funnel-shape; and *f*, is the handle. The mode of operation is as follows:—Ground coffee, or any other matter, from which a decoction is desired to be obtained, is put into the vessel through the mouth *e*, and boiling water is poured thereon; the mouth is then closed, by straining over it linen, or cotton cloth, or other filtering material; and when this is done, the vessel is inverted, as shewn in the drawing, and the heater *d*, is placed in the tube *b*. By the application of the heater, steam will be generated in the vessel, which will rise towards *c*, and, expanding, will cause the liquid to percolate through the filtering material strained over the mouth of the vessel.

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The patentee claims the mode of constructing apparatus, to act by being inverted, aided by the application of heat.—[*Inrolled in the Inrolment Office, December*, 1841.]

To JAMES BOYDELL, JUN., *of the Oak Farm Works, near Dudley, Staffordshire, iron-master, for improvements in the manufacture of keel-plates for vessels, iron gates, gate-posts, fencings, and gratings.*—[Sealed 24th May, 1842.]

THIS invention consists, Firstly,—in a method of forming keel-plates for vessels, by rolling, instead of hammering, as heretofore. Secondly,—in making iron fences, gratings, and gates, by welding a series of bars together by rolling; and Thirdly,—in making the feet of iron posts, for gates and fences, by forming an enlargement, or block of scoria, on that end of the post which is to be inserted into the ground.

The mode adopted by the patentee, for manufacturing keel-plates, will be seen by reference to the following figures, in Plate VI.:—Fig. 1, is a section of an angle iron, formed by rolling; two of these pieces form the sides of the keel-plate, and the plate which forms the bottom, is shewn at fig. 2; they may be made of from seven to nine feet long, or of any convenient length. Fig. 3, shews the angle irons and flat plate combined, or clamped with wooden cramps. When thus attached, they are placed in a proper furnace, and heated to a welding heat; the cramps are, consequently, consumed, and the edges of the metal melted sufficiently to hold the pieces together, when they are taken from the furnace. The combined parts are then passed between rollers, of the form the keel-plates are desired to be made, in order to securely weld the parts together. The keel-plate, thus formed, may then be passed through three or more pairs of rollers; the spaces, between each pair, being somewhat less than that of the pair previously employed; and after this process of rolling is effected, the metal will have assumed the form shewn at fig. 4, and will then be complete, and fit for use.

The patentee remarks, that although he considers it better to form keel-plates of three pieces, combined by welding, (as

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by that means he can obtain a greater thickness at the junctions of the metal,) yet he considers the shaping of keel-plates by means of suitable rollers, by which the trough may be gradually sunk, a preferable mode to bending the metal by hammering.

The second part of the invention consists in attaching several bars of iron together, arranged in the form of a gate, or grating, as shewn at fig. 5, and then heating them to a welding heat, and passing them through rollers, such as are commonly used for rolling iron plates, in order to weld the bars into a rigid framing.

The third part of the invention consists in forming a block on the ends of iron gate-posts; for this purpose, a mould of thin sheet-iron is formed, of the size required, for the foot of the post, and in it the bar or foot is placed, and secured in a perpendicular position; liquid scoria is then poured into the mould, and by this means the enlarged foot is obtained.

The patentee claims, Firstly,—the manufacturing of keel-plates for vessels, by rolling iron into the proper form, as above described. Secondly,—the mode of making gates, fencing, and gratings, by welding bars by rolling, in manner above stated; and Thirdly,—the method of applying feet to iron posts for gates, and for fences, by casting or forming thereon scoria, or cinder of iron-works, as above described.—[*Inrolled in the Inrolment Office, November*, 1842.]

To WILLIAM WARBURTON, *of Oxford-street, in the County of Middlesex, Gent., for certain improvements in the construction of carriages, and apparatus for retarding the progress of the same.*—[Sealed 8th September, 1842.]

THESE improvements consist, Firstly,—in novel and peculiar constructions and arrangements of the parts of omnibuses, for the conveyance of passengers on ordinary roads, which are principally designed to shut off, and render private, certain parts or compartments of the carriage, when required; and, Secondly,—an apparatus, which is to be attached to omni-

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buses, or other carriages, for the purpose of enabling the conductor to retard the progress of the same, when descending hills, or under other circumstances.

In these improved omnibuses, there are three distinct compartments, for different classes of passengers, viz., a saloon, at the hinder part, to contain the greater number; a central or private compartment, capable of being divided by fixed or moveable partitions; (and, if required, into distinct boxes) and a front compartment, called a cabriolet or coupée.

Fig. 1, in Plate VI., represents the side elevation of an omnibus, divided into three compartments, as above stated; fig. 2, is a vertical section, taken longitudinally through the same, and shewing the internal construction, and the mode of dividing the carriage into distinct compartments; and fig. 3, is a horizontal section, or plan view, of the carriage, by which the partitions will be seen; and also the proposed arrangement and form of the seats, of which there are intended to be accommodation for sixteen inside passengers. The hinder compartment differs but little from the interior of an ordinary omnibus, there being one door at the back, and four seats on each side, and one at the front end. The middle compartment, to hold four persons, is divided into two parts, by a fixed transverse partition, reaching from the floor to the roof; and these may again be divided, if required, by sliding longitudinal partitions, each reaching from the floor to the roof, to be locked or fastened, by the conductor, when desired; thereby forming four distinct private boxes, each capable of holding one person, and having a distinct door to each, from the outer side. The front compartment, which is partially open, is formed like the body of a cabriolet, and with inclined flap-doors, if required,—the driver sitting upon a seat above, contiguous with the roof.

The patentee prefers making the fore-wheels nearly as large in diameter as the hind wheels, in order to facilitate the draft; and these will be allowed to lock under the carriage by the peculiar form of the framing of its fore part, which is strengthened by bent iron bars, or "edge plates," in the way commonly practised in building double-bodied carriages. A, B, C, figs. 2, and 3, indicate the three distinct compartments into

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which the carriage is divided; A, being the cabriolet part or coupeé; B, the private boxes; and C, the saloon or hinder part. The coachman's seat *a*, is situated above the cabriolet part. The private compartment B, is divided laterally, as above mentioned, by the fixed transverse partition *b*, *b*, which is furnished with moveable shutters *c*. This compartment is again divided laterally by moveable sliding partitions or shutters *d*, which, if required, may be pushed back into the cases *e*, *e*, thereby allowing two friends to converse with each other. These partitions or shutters may be made either rigid or flexible; but the patentee prefers making them flexible, as shewn in the drawing, whereby they may, with facility, be pushed back into the case, in which operation they are assisted by the spring barrels *f*, *f*. The shutter cases *e*, *e*, and spring barrels *f*, *f*, may, however, be dispensed with, if thought desirable, and the flexible shutters pushed back into a recess behind one of the passengers. *g*, *g*, are flexible pipes connected to a main tube *h*, for the purpose of communicating with the conductor. The position of these tubes is shown by dots in fig. 3. The compartments B, and C, are ventilated by the narrow longitudinal openings *i*, *i*, which are covered with wire gauze, perforated zinc, or other metal, or horse hair, or other similar opened worked cloth. By this means, a perfect ventilation is effected, without, at the same time, creating a draught, as the current of air, in entering the carriage, is divided into a great number of thin streams.

Fig. 4, represents a horizontal section of another arrangement, in which there is no private compartment. The cabriolet part, or coupée, is however retained, as in the former, and the saloon or hinder part will hold a greater number of passengers; and each seat is distinct, and divided from the adjoining one by dwarf wicker or cane-work partitions *j*, *j*. The doors, to the saloon, are placed in front, just behind the fore-wheels, and the conductor stands on a platform *k*, at the back of the carriage. A check-string, or communication tube, runs along the roof of the carriage to the conductor, who can thus speak with any of the passengers.

The second head of the invention, viz., apparatus for retarding the progress of carriages, in descending hills, is shewn

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at fig. 1; it consists of a block of wood *m*, which is placed at the back of, and attached to, one of the splash-boards or wings *n*. The iron framing of this splash-board is jointed at *o*, and its upper end is connected, by a joint, to the horizontal rod *p*, the opposite end of which is connected to the upright hand-lever *q*. This lever turns on a centre at *r*, and when moved back, by the conductor, into the position shewn by the dotted lines in fig. 1, the wooden or other block *m*, will be made to bear against the periphery of the wheel, and thereby retard the progress of the carriage.

The patentee claims, Firstly,—the peculiar arrangement or combination of parts, as shewn in the drawings. Secondly,—the application of a cabriolet and coupée front; and also the employment of private boxes to carriages, commonly called or known by the name of omnibuses, and which boxes may be quite private, or made to communicate as described. Thirdly,—the method, above described, of shutting off, or rendering private, at pleasure, the various compartments of the part B, in figs. 1, 2, and 3, by means of fixed and moveable rigid folding or flexible shutters, or partitions. Fourthly,—the retarding apparatus, as shewn and described.—[*Inrolled in the Petty Bag Office, March*, 1843.]

Specification drawn by Messrs. Newton and Son.

To NATHANIEL CARD, *of Manchester, in the County of Lancaster, candle-wick maker, for his invention of certain improvements in the manufacture of wicks for candles, lamps, and other similar purposes; and in the apparatus connected therewith.**—[Sealed 8th September, 1841.]

THESE improvements consist, Firstly,—in preparing the cotton or linen thread, of which they are to be made, either by hand or machinery, so that the wick is considerably improved, for the use of either wax or tallow chandlers, or for use in vari-

* By a memorandum of alteration, lodged with the Clerk of the Patents, dated November 17th, 1842, it appears that the patentee disclaims the words "lamps and other similar purposes," in his title; and also all the description in his specification, referring to these objects.

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ous kinds of oil-lamps, for which they may be suitable; and Secondly,—in the application of the ordinary doubling or twisting machine, to prepare the same. The best wicking is manufactured from the short staple or finest Smyrna cotton. The cotton, or flax, having first been spun into thread, of the usual size employed for such purposes, two or more such threads are to be doubled, or slightly twisted together, (two are preferred,) into a strand or twist, and afterwards as many in number of such strands, or twists, as are intended to constitute the wick, are to be placed together, and again twisted, from end to end, to form the complete wick.

It will be understood, that the principal feature of novelty in this improved manner of forming the wick, is simply the use, or application, of double threads, or strands, being twisted together to form the wick, instead of taking single threads, and twisting them bodily together, as hitherto done, in wick-making. The employment of double threads, for wicks, is of considerable importance and advantage; as, in the first place, all the loose fibres are twisted in, which entirely prevents the occurrence of what are termed "wasters;" and its peculiar combination, or construction, will also prevent the wick falling, or turning over, into the tallow, or other material, when burning, as the twisted strands will support each other, and preserve the upright position of the wick. Another advantage, arising from the use of double threads for wicking, is, that the body of the wick being more open and porous than the common wick, the inflammable substance, and also the air, are much more freely supplied to the flame, through its passages, which not only assist the illuminating power, but materially prevent the generation of smoke, during combustion. A considerable economy is also effected by the use of double-thread wicking, as about two-thirds of the double thread is only requisite to form the same sized wick as commonly produced with the full quantity of cotton, merely twisted together in the usual manner; the candle will also be found to burn much longer.

Thirdly,—these improvements consist in charging or filling the cotton wick with oxygen gas, in order that a greater degree of oxygen may be supplied to the flame, during com-

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bustion, and the clearness and brilliancy of the light improved. The presence of pure oxygen gas will be found also to preserve the wick from the effects of damp. The cotton being of itself cellular and porous in the fibre, if not completely tubular from end to end of the staple, is capable of being bodily charged with gas, which may be done as follows:—Place the wicking, either in lengths for use, or in the ball, in an air-tight vessel or chamber, and exhaust the same, by means of a common air-pump, and the air being now completely drawn out of the cotton, admit pure oxygen gas from a gasometer, placed in connexion with the exhausted vessel; the gas, as it passes, should be heated or dried in the connecting-pipe, for the purpose of preventing any moisture passing with it into the cotton. The cotton wicking being thus oxygenated, may be removed for use.

The apparatus employed by the patentee, for manufacturing the wicks, and winding the wicking, in lengths, upon a reel or bobbin, is a slight modification of the ordinary doubling machine. A series of bobbins, of the double or single threads or strands, as many in number as are intended to constitute the wick, are placed in an ordinary creel, and conducted altogether into one of the hollow arms of a revolving flyer (similar to that used for roving cotton); they are wound from thence upon a large bobbin or reel, the flyer making one or more revolutions, in a given time, more than the speed of the bobbin *a*, round which it revolves, to give the necessary degree of twist to the series of threads or strands, and thus form the wicking.

In Plate VI., fig. 1, represents a microscopic view of the staple, or fibre, of ordinary Smyrna cotton, (which is preferred for wicking,) shewing the cellular or porous construction thereof, capable of receiving the gas; fig. 2, shews the improved wicking, formed from double threads; and fig. 3, an ordinary candle-wick, of single threads.

The patentee claims, Firstly,—the application, use, or employment of doubled threads in the manufacture of wicks, either for wax, tallow, or spermaceti candles, or any other inflammable matter, or for lamps. Secondly,—the charging or filling cotton or wicks with oxygen gas, whether the wick.

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is of the improved, or of the common, construction; and Thirdly,—the application of the doubling apparatus, above alluded to, for manufacturing the improved wicks, in lengths, for use.—[*Inrolled in the Petty Bag Office, March*, 1842.]

Specification drawn by Messrs. Newton and Son.

To NATHANIEL CARD, *of Manchester, in the County of Lancaster, candle-wick manufacturer, for certain improvements in the manufacture of candle-wick, and in machinery or apparatus for producing such manufacture.*—[Sealed 14th January, 1843.]

THESE improvements, in the manufacture of candle-wick, apply particularly to the common or well-known plaited or platted wick, used in candles, for supporting combustion, and consist, Firstly,—in the introduction of one, two, or more straight distended warps, to form the base of a platted or woven candle-wick, such wick being made from three or more strands of cotton; and the said warp or warps (which are preferred to be made of doubled yarns, as described in the preceding specification) are to be placed within, or distended through, the body of the platted or woven wick, in a straight direction; that is, around them the other strand or strands of weft are to be passed or bound, by platting or weaving. The wick may be made with one straight warp and three platted wefts, or two or more straight warps, with one or more platted wefts; keeping in view the necessity of the warps always passing in a distended state, directly through the wick.

The second feature of these improvements consists in the application or employment of braiding machines, having hollow tubes for the passage of the warps, for the purposes above described; that is, for platting or braiding around the distended warps, for the production of the said candle-wick, in order to enclose the warps in the body of the wick; such machinery, though well-known, for making braidings, has never before been applied to the making of candle-wicks. In place of using hollow tubes, the bobbins, which contain the warps, may be mounted on the revolving spindles, on which

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the "rose heads," or carriers, are placed, with precisely the same result. The patentee also proposes the application or employment of the ordinary loom, for weaving this improved candle-wick, as it has never before been so applied.

These wicks may be produced in the ordinary loom, by causing the warps to be distended through the loom; that is, from the ordinary warp-roller to the work-roller. One weft may be placed in each shuttle, and passed to and fro; (the warps being shed, or divided, after each pick, as in common weaving) and hence, each wick will be produced from one weft only; but if two or more strands of weft are required for each wick, there must then be a shuttle, provided with weft, for each strand, and "drop-boxes" employed to effect the alternate rising of the shuttles, as each particular strand is required for the formation of the plat.—[*Inrolled in the Petty Bag Office, July*, 1843.]

Specification drawn by Messrs. Newton and Son.

To George Phillips Bayly, *of No.* 146, *Fenchurch-street, in the City of London, brush-maker, for his invention of certain improvements in brushes.*—[Sealed 26th January, 1843.]

This invention relates to certain improved methods of fastening or securing the hairs or bristles of brushes, whereby they will not be so liable to come out, as in ordinary brushes of nearly all descriptions. The invention applies more particularly to tooth, nail, and other brushes, which are subject to immersion in water; and the manner in which it is carried into effect is first described with reference to a tooth-brush. A piece of bone, or ivory, is obtained of the usual shape, and, in the face of the broad part, a number of circular holes are drilled, as in the ordinary brush, for the insertion of the bristles; but, in place of cutting the longitudinal slits, or grooves, at the back of the brush, a cavity is formed therein. The knobs or butts of the bristles, are drawn through the holes, by means of wires, in the ordinary manner, into this cavity or hollow back; and it should be ob-

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served, that immediately the knobs or butts of the bristles, emerge from the holes into the hollow back, they expand, and form a sort of dove-tail, which, of itself, holds them in; they are moreover retained by the wire that draws them through; and, in order to render each individual hair still more secure, a liquid cement, in a boiling state, is poured into the cavity of the hollow back, which, being in a perfectly fluid state, insinuates itself into the interstices between the hairs, or bristles, of each particular bunch, and effectually prevents any single hair from being withdrawn. All the superfluous cement having been removed, the back of the brush is covered with a plate of bone or ivory, which, being rivetted on, gives the appearance of a solid-back brush.

Instead of cutting, or excavating, the back of the brush, so as to form a hollow back, as in the former instance, grooves may be formed at the back of the holes, through which the bristles are drawn; but these grooves must be of such a width as to admit of the knobs or butts of the bristles expanding, when they are drawn through the holes; cement is afterwards filled in, as in the former instance, and the bristles are effectually secured. If required, after the superfluous cement has been removed, an ivory or bone back may be rivetted on, thereby giving the brush the appearance of a solid back; or it may be left without one, when the brush will resemble the ordinary "waxed back."

In manufacturing nail-brushes, according to this improved plan, metal stocks, or handles, are sometimes employed, instead of ivory or bone ones. The metal preferred, for this purpose, is an alloy, known by the name of German silver or "albata." The stock, or handle, is made in the shape of a shallow box, and the holes, through which the bristles are to be drawn, having been produced in any convenient manner, the brush is completed, according to the method first described.

The cement employed, for securing the bristles, is composed of shell-lac and resin; the proportions are not essential; or other cements may be used, if found convenient.

The patentee does not claim the exclusive use of cement in whatever way it may be employed, as the hairs have been

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so fixed in shaving-brushes; but he claims the manufacturing of tooth, nail, and other brushes, in the manner, and upon the principle, hereinbefore set forth and described; that is to say, in addition to the ordinary mode of retaining the bunches of bristles, by means of wire, thread, or silk, every individual hair or bristle is further secured by means of a liquid cement. —[*Inrolled in the Petty Bag Office, July,* 1843.

Specification drawn by Messrs. Newton and Son.

To WILLIAM HUNT, *of the Portugal Hotel, Fleet-street, in the City of London, manufacturing chemist, for improvements in the manufacture of potash and soda, and their carbonates.*—[Sealed 21st January, 1840.]

IN manufacturing carbonate of soda, it is the usual practice to decompose common salt, by means of sulphuric acid, (which has hitherto been obtained for such purpose at great expence,) and then to convert the sulphate of soda, produced by such decomposition, into carbonates of soda.

By this improved process, common salt is decomposed, either by means of the metallic sulphates, hereinafter mentioned, or by means of sulphuric acid, obtained by the use of these sulphates and the metallic sulphurets, hereinafter mentioned, or some of them. The sulphate of soda, thus produced, is decomposed with coke or other carbonaceous matter, and by dissolving the product of this decomposition, a solution containing hydro-sulphuret of soda, is obtained; this hydro-sulphuret is decomposed by means of one of the metallic oxides, hereafter mentioned, and sulphur is thus transferred from the solution of hydro-sulphuret to the metal of the oxide employed. A mixture of caustic soda, in solution, is thus obtained, and also insoluble metallic sulphuret; these are separated, and the sulphuret is either subjected to the processes by which sulphuric acid and metallic oxide are obtained, or it may be converted into sulphate, and used to decompose common salt, and produce sulphate of soda and muriate of the metallic oxide employed; and afterwards obtain, from this muriate, metallic oxide.

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The oxide produced by either of the means hereinbefore mentioned, is suitable to be used for decomposing hydro-sulphuret of soda, and thereby producing a further quantity of caustic soda, in solution; and by using it for this purpose, a metallic sulphuret is reproduced, suitable to be employed for producing a further quantity of sulphuric acid, metallic sulphate, and metallic oxide.

The caustic soda obtained, in solution, is either used in this state, or the solution is evaporated, to obtain solid caustic soda; or the caustic soda may be converted into carbonate of soda, by causing it to absorb carbonic acid; and the solution may then be evaporated, to obtain dry carbonate of soda, or crystals of soda.

The metallic sulphates employed by the patentee for decomposing common salt, or for producing sulphuric acid and metallic oxide, are the sulphates of copper and of zinc; and the metallic sulphurets used for producing sulphuric acid and metallic oxide, are the sulphurets of copper and of zinc; and the metallic oxides used for decomposing hydro-sulphuret of soda, are the deutoxide of copper and the oxide of zinc.

When sulphuric acid is used, to decompose common salt, and produce sulphate of soda, this decomposition is effected by some of the means in ordinary use for that purpose.

When sulphate of copper is used, to decompose common salt, a solution, containing this sulphate, is obtained, and common salt added, until the solution contains five per cent. more salt than is equivalent to the sulphuric acid, and these are digested together; a solution is thus obtained, containing sulphate of soda and muriate of copper. The solution is then evaporated, and a great part of the sulphate of soda separated in small crystals, which are then washed with water, to separate the muriate of copper therefrom; the crystals are then dissolved, and any copper contained in the solution precipitated therefrom, by means of metallic iron, or of a solution of hydro-sulphuret of soda; the solution being then evaporated, sulphate of soda is obtained, suitable to be used for the manufacture of soda.

After the sulphate of soda is thus separated from the muriate of copper, the muriate is decomposed, by means of

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metallic iron or of lime. If iron be used for this purpose, it is introduced into the solution, and copper obtained, as a precipitate, and muriate of iron in solution. If lime be used, a fine milk thereof is prepared, and added gradually to the solution of muriate of copper, until the copper is thrown down as a hydrated deutoxide of copper; the mixture is then placed in a reverberatory furnace, and the water driven off by heat; a dry deutoxide of copper, mixed with chloride of calcium, being thus obtained, which products are separated by washing the remaining deutoxide of copper.

When sulphate of zinc is used, to decompose common salt, a solution, containing this sulphate, is obtained, and common salt added, until the solution contains five per cent. more salt than is equivalent to the sulphuric acid; these are then digested together, and a solution obtained, containing sulphate of soda and muriate of zinc; the sulphate of soda is then separated therefrom, by the means hereinbefore described, for separating sulphate of soda from muriate of copper; and any zinc contained in the solution of sulphate of soda, is precipitated, by means of hydro-sulphuret of soda; the solution is then evaporated, and sulphate of soda obtained, suitable to be used for the manufacture of soda. After the sulphate of soda is separated from the muriate of zinc, the muriate is decomposed, by means of lime, or steam and heat. If lime be used, the same mode of proceeding is adopted as described, with reference to the decomposition of muriate of copper; and an oxide of zinc is produced, suitable to be used for decomposing hydro-sulphuret of soda, and producing soda. If steam and heat be used, the solution of the muriate is introduced into a furnace, and evaporated to dryness, thus producing a chloride of zinc; the heat is then increased, and a current of steam passed over the chloride; muriatic acid is thus driven off, and an oxide of zinc obtained,—any remaining chloride being separated by washing; after which, the oxide of zinc will be suitable for decomposing hydro-sulphuret of soda, and producing soda. When the solution is obtained, containing sulphate of soda and muriate of zinc, by the means hereinbefore mentioned, the patentee sometimes introduces it into a furnace, called a "distilling furnace," which is hereinafter

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described, and the water is driven off; thus converting the muriate of zinc into chloride; the heat of the furnace is then increased to a degree sufficient to cause the chloride to volatilize, and the vapour conducted into a receiver, and there condensed. The residuum, in the furnace, contains sulphate of soda, oxide of zinc, and muriate or sulphate of zinc, which residuum is digested with water, and the sulphate of soda, and sulphate or muriate of zinc, is thus dissolved. The oxide will remain undissolved; any zinc contained in the solution is then precipitated, by means of hydro-sulphuret of soda, and the solution afterwards evaporated, thus obtaining sulphate of soda, suitable for manufacturing soda. The condensed chloride of zinc, collected in the receiver, hereinbefore mentioned, is dissolved, and a solution of muriate of zinc obtained; the muriate is then decomposed, by means of lime, in the same manner as before described, for decomposing muriate of copper, and an oxide of zinc obtained, suitable for decomposing hydro-sulphuret of soda, and producing soda. The dry sulphate of soda, for that purpose, may be decomposed, by mixing it with powdered coke, or coal, in the proportion, (by weight) of about three parts of sulphate to one part of coke or coal, and fluxing this mixture in a reverberatory furnace, which is described hereafter as the "decomposing furnace."

By decomposing sulphate of soda, a sulphuret of sodium is obtained, mixed with caustic soda, carbonate of soda, and other matters; this product is dissolved, by lixiviating it with water, and a solution obtained, containing hydro-sulphuret of soda, and some sulphuret of soda; this solution is to be boiled in suitable vessels, and a mixture then added of deutoxide of copper and metallic copper, or of oxide of zinc and metallic zinc, in the proportion of twenty parts, (by weight) of deutoxide of copper, or oxide of zinc, to one part (by weight) of metallic copper, or metallic zinc; the boiling is continued, and the mixture of oxide and metal gradually added, until the hydro-sulphuret of soda, and the sulphuret of soda, are completely decomposed. The products of this decomposition are caustic soda, in solution, and an insoluble metallic sulphuret; and, in order to separate these, the sulphuret is allowed to subside, the solution drawn off, and the sulphuret

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washed with water, to extract a further quantity of soda; caustic soda is thus obtained, and the solution may be evaporated, until it becomes sufficiently strong to yield solid caustic soda.

The patentee next describes the process by which he obtains metallic sulphates, sulphuric acid, and metallic oxides, (suitable to be used in the operations hereinbefore described,) from the sulphurets of copper and zinc, obtained by the processes before mentioned. When it is desired to produce metallic sulphate, the furnace, hereafter described as the "sulphating furnace," is used. This furnace having been heated, until it has attained a temperature of about 400° of Fahrenheit, sulphuret of copper, or of zinc, is placed therein, and a current of atmospheric air caused to pass through it. The heat is kept up, and the sulphuret raked occasionally, and at the end of about twelve hours, the greater part of the sulphuret will be converted into sulphate. The product of this sulphating operation is to be lixiviated with water, and a solution will thus be obtained of sulphate of copper, or of zinc, (as the case may be,) suitable for decomposing common salt. The residuum of this lixiviation will contain oxide and sulphuret. If the oxide predominate, it is used to decompose hydro-sulphuret of soda, in the manner hereinbefore mentioned; but if the sulphuret predominate, the residuum is returned into the "sulphating furnace," for the purpose of converting the sulphuret into sulphate. When the sulphate, obtained by the sulphating operation, is to be used for making sulphuric acid, the product of such operation is placed in the furnace hereinbefore described, as the "distilling furnace;" and such product is heated to a bright red heat, by which means sulphuric acid is driven off. During this operation, a small current of atmospheric air passes through the "distilling furnace," and the gases produced pass through a pipe, provided for that purpose, into a condensing apparatus, similar to the leaden chambers now in general use, in the manufacture of sulphuric acid.

In the process, hereinbefore described, for obtaining sulphuric acid from sulphuret of copper, or sulphuret of zinc, the sulphuret employed is converted into sulphate, in the first

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instance; but the patentee also obtains sulphuric acid by the use of either of these sulphurets, without previously converting it into sulphate. For this purpose the sulphuret is dried by any convenient means, and then put into the furnace hereinafter described, as the "furnace of combustion," and there heated to redness; during which operation, a current of atmospheric air passes through the furnace, and sulphurous acid gas is produced by the action of the atmospheric air on the sulphuret. The gas passes off through a pipe, provided for that purpose, into a leaden chamber, similar to those generally used in the manufacture of sulphuric acid; and the sulphurous acid, thus obtained, is converted into sulphuric acid, by means of nitrous acid vapour and the atmospheric air which has passed through the "furnace of combustion." The residuum, which remains in the "distilling furnace" and the "furnace of combustion," (after the distilling operation and the operation of combustion have been completed,) contains oxide of copper, or oxide of zinc, (as the case may be,) sulphate, and sub-sulphate; and by the process hereinafter described for that purpose, such residuum is rendered suitable for decomposing hydro-sulphuret of soda, and producing soda.

The patentee here describes a mode by which sulphuric acid may be obtained from a mixture of sulphate and sulphuret of copper, or of zinc.

The following is a description of the invention, as applied to the manufacture of potash and its carbonate. The salts of potash, to be used, are the muriate, the nitrate, and the sulphate of potash. When the muriate is employed, the invention is applied in the same manner, in every respect, for producing potash and its carbonate, by the use of this salt, as before described, for producing soda and its carbonate, by the use of common salt, which is known to be muriate of soda. Nitrate of potash, when used, is decomposed by sulphuric acid, and thus sulphate of potash and nitric acid are obtained; and this, or any other sulphate of potash, is used for producing potash and its carbonate, in every respect, in the same manner as that described for producing soda and its carbonate, by the use of sulphate of soda.

In Plate V., are views of the several furnaces used in the

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various processes before mentioned. Figs. 1, and 2, represent the "decomposing furnace;" fig. 1, being a transverse vertical section of such furnace, and fig. 2, a longitudinal vertical section of the same; this latter section being taken in the line a, b, of fig. 1, and the section, fig. 1, being taken in the line a, b, of fig. 2. *a, a,* are the ash-pits; *b, b,* the gates; *c, c,* the fire-places; *d, d,* the arch; *e, e,* the bridges; *f, f,* the fire-doors; *g,* the flue, communicating with the chimney; *h, h,* doors, through which coke or coal is introduced on the floor of the furnace; *h**, the door through which the sulphate of soda, or potash, is introduced; *i, i,* the floor of the furnace, which is inclined, so as to form an angle of about 4° with the horizontal line *l, l*;—*k, k,* the brick-work of the furnace; *n,* the opening, through which the product of the operation flows. The arrows denote the current of the flames from the fire-places.

Figs. 3, and 4, represent the "distilling furnace;" fig. 3, being a transverse vertical section of such furnace, and fig. 4, a longitudinal vertical section of the same; this latter section is taken in the line a, b, of fig. 3, and the section fig. 3, in the line a, b, of fig. 4. *a,* is the ash-pit; *b,* the grate; *c,* the fire-place; *d,* an arch, forming the bottom of the distilling chamber; *e,* an arch, forming the top of the distilling chamber; *j,* the distilling chamber; *f, f,* the flue, by which the flame passes under the lower arch, and over the upper arch, and arrives at the flue *g,* which communicates with the chimney; *i,* brick-work, closing the ends of the distilling chamber *j*;—*k,* a pipe, for conducting the vapours produced by the distilling operation, to the condensing apparatus; this pipe is formed of double walls of brick-work, having an interstice between them, which is filled with fine sand, or ground fire-clay, to prevent the escape of gas; *h,* the door, for charging the furnace, which door does not close tightly, and therefore admits a current of air to pass into the chamber; *m, m,* the brick-work of the furnace; *n,* the upper arch. The arrows denote the current of the flame from the fire-place.

The "sulphating furnace" is constructed in the same way as the "distilling furnace," excepting that the chamber *j,* is about twice as long as the chamber of the "distilling furnace,"

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and there are two doors, for charging such chamber. Figs. 5, and 6, represent the furnace of combustion; fig. 5, being a transverse vertical section of such furnace, and fig. 6, a longitudinal vertical section of the same; this latter section is taken in the line a, b, of fig. 5, and the section fig. 5, in the line a, b, of fig. 6. *a*, is the ash-pit; *b*, the grate; *c*, the fire-place; *d*, an arch, forming the bottom of the lower chamber of combustion; *e*, an arch, forming the top of the lower chamber of combustion; *f*, the lower chamber of combustion; *h*, is an arch, forming the bottom of the upper chamber of combustion; *i*, an arch, forming the top of the upper chamber of combustion; *j*, is the upper chamber of combustion; *m*, *m*, are flues in the brick-work of the side of the furnace, for the purpose of conducting the flame, after it has passed under the arch *d*, to the space marked *g*, between the arches *e*, and *h*; and *n*, *n*, are flues, to conduct the flame to the space marked *k*, above the arch *i*, whence it escapes into the chimney by the flue *o*. The flues *m*, *m*, and *n*, *n*, are denoted by dotted lines; and the arrows, not marked with an asterisk, denote the current of the flame; *t*, *t*, are walls, closing the ends of the chambers *f*, and *j*, except as to an opening left in each wall to provide for the passage of gas into the pipe *s*;—*l*, is the upper arch; and *p*, *p*, the brick-work of the furnace; the chambers *f*, and *j*, are provided with iron doors, at the front, marked *q*, *q*, through which the charges of material are introduced, and which admit atmospheric air to pass through the chamber during the operation; *s*, is a pipe, communicating with a leaden chamber. The arrows, marked with asterisks, denote the current of the gas.

The patentee's claims are as follow:—"I claim, as my invention, a combination of processes, by which potash or soda may be produced by the action of deutoxide of copper, or oxide of zinc, obtained from the sulphuret of copper, or the sulphuret of zinc, produced by the use of my invention, on hydro-sulphuret of potash, or hydro-sulphuret of soda; and the metallic sulphuret, produced by this action, is either converted into deutoxide of copper or oxide of zinc, suitable to be applied to act on hydro-sulphuret of potash or hydro-sulphuret of soda; and the sulphur, contained in the sul-

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phuret, is converted into sulphuric acid, suitable to be used for decomposing muriate, or nitrate of potash, or common salt, for the purpose of manufacturing potash or soda; or otherwise the metallic sulphuret, produced, is converted into sulphate of copper, or sulphate of zinc, and this sulphate is used to decompose muriate of potash or common salt, and produce sulphate of potash or sulphate of soda, and also deutoxide of copper, or oxide of zinc, suitable for decomposing hydro-sulphuret of potash or hydro-sulphuret of soda, to produce potash or soda. I also claim the manufacture of carbonate of potash, and carbonate of soda, by means of the potash and soda obtained by such combination of processes as hereinbefore mentioned. I also claim the application in the manufacture of potash or soda, or their carbonates of sulphate of potash, or sulphate of soda, obtained by decomposing muriate of potash, or common salt, by means of sulphate of copper or sulphate of zinc, obtained from the sulphurets of these metals. And I also claim the improved mode of decomposing sulphate of potash and sulphate of soda, for obtaining hydro-sulphuret of potash, or hydro-sulphuret of soda, to be used in the manufacture of potash, or soda, or their carbonates; which improved mode consists in decomposing sulphate of potash, or sulphate of soda, and thus producing sulphuret of potassium, or sulphuret of sodium, by causing such sulphate, in a state of fusion, to flow gradually through a bed of coke or coal."—[*Inrolled in the Petty Bag Office, July,* 1840.]

To Henry Samuel Rush, *of Sloane-street, mechanic, for improvements in apparatus for containing matches, for obtaining instantaneous light.*—[Sealed 29th December, 1842.]

The novelty of this invention consists in introducing lucifer matches into a peculiarly constructed box, which, when the matches are quickly withdrawn, causes them to ignite.

The patentee states, that he is aware this construction of box is already the subject of a patent, (see Vol. XI., p. 160,

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Conjoined Series,) he therefore claims merely his peculiar method of introducing the matches into the box; which is, by dropping them in through the bottom, and afterwards putting a cover thereon, to prevent them from falling out, instead of inserting them in their separate compartments, as described in the specification of the former patentee.—[*Inrolled in the Inrolment Office, June*, 1843.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

No. 555. "Description of the Roofs over Buckingham Palace, covered with Lord Stanhope's composition."

By Peter Hogg, Assoc. Inst. C. E.

(Continued from page 58, Vol. XXIII.)

Mr. Poynter presented a drawing of the mode of setting the pots for melting and preparing the composition, the proportions of which he stated somewhat differently from those given in the paper.

Three measures of ground chalk, dried and sifted very fine, were mixed and kneaded up with one measure of tar; these ingredients were melted in an iron pot, set in such a manner that the flame should not impinge too violently upon it. The first, or "skimming" coat of the covering being laid on of a thickness of 3-sixteenths of an inch, the finishing coat was composed by adding to the former mixture three measures of hot sifted sand, well mixing the whole together; the composition was laid on with a tool similar to a plasterer's trowel, but much stronger.

Mr. Nash, when he first tried the composition, found that the surface became disintegrated by exposure to the weather; he therefore added the slates imbedded in the second coat, and subsequently never used the mixture without them.

In reply to questions from the President and other members, Mr. Nixon stated, that he was employed under Mr. Nash when the palace roofs were executed, and he could bear testimony to

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their durability and soundness. The roofs at East Cowes castle, which were covered with the composition in the year 1808, and those of the pavilion at Brighton, in 1816, were now in as good state as when they were finished. The failure at Mr. Nash's house in Regent Street, arose from the roof having been originally composed of mastic, which soon cracked. One coat of the Stanhope composition was spread over it, to stop the leaks, but it was insufficiently done, and ultimately Mr. Rainy had a new roof, properly constructed, with two coats of composition, which had remained sound to the present time. The price of these roofs, when well constructed by the person who did those of the palace, was about five guineas per square.

Mr. Hogg observed, that the chalk was only exposed to such a heat as would evaporate any moisture it contained. The weight of the two coats of Stanhope composition, including the slate imbedded in it, was about 12 lbs. per superficial foot.

Mr. Sibley considered the Seyssel Asphalte, when carefully laid, preferable to any composition of a similar nature; he had used it extensively, and was well satisfied with it, both for roofing and paving.

Mr. Hogg objected to the use of Asphalte for roofing, as it was liable to injury, being of a brittle nature; it was not elastic, and it shrunk from the walls, thereby causing leaks. Lord Stanhope's composition did not possess these faults, and he did not consider that it was superseded by asphalte.

Mr. Moreland had covered the roof of the tread-mill at the Giltspur Street Compter with asphalte, and had found it answer perfectly. It was laid on in a thickness of $\frac{3}{8}$-inch, upon roofing-boards $\frac{3}{4}$-inch thick, with canvas nailed on them, with an entire fall of only 9 inches; there was not any appearance of leakage.

Mr. Davison had caused a school-room to be floored with asphalte, four years ago, and up to the present time there was no symptom of wearing down, although the stones, which were let into the floor, for supporting the desks, &c., were considerably abraded. He believed that the only failures of the asphalte had occurred from the use of inferior ingredients. Gas tar had been used instead of vegetable tar, and in those cases the result had not been successful.

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No. 559. "Account of the Victoria Bridge, erected across the River Wear, on the line of the Durham Junction Railway."

By David Bremner, Assoc. Inst. C. E.

The district through which the Durham Junction Railway passes, for the purpose of completing the connection between the city of Durham, with the towns of Newcastle, South Shields, and Sunderland, is extensively undermined by coal-workings, and great caution was requisite in the selection of a spot which suited the level of the railway, and where a foundation could be formed sufficiently sound to support such a structure as the bridge described in the paper. The advice of Messrs. Walker and Burges was therefore sought by Mr. Harrison, the engineer of the line, and their design was adopted; but subsequently several alterations were made, either to favor the locality or from motives of economy.

The bridge is 810 feet 9 inches long, and 21 feet wide, between the parapets. It is, with the exception of the quoins of the main arches, built of freestone, from the Pensher quarries; there are three semicircular arches, of 144 feet, 100 feet, and 60 feet span respectively, a centre arch of 160 span, with a radius of 72 feet, and three arches of 20 feet span each at either end, forming the abutments. The main pier is founded upon rock, 24 feet beneath the bed of the river; and the height from the foundation to the top of the parapet is 156 feet 6 inches; the under side of the main arch, at the crown, is thus 121 feet 9 inches above the level of the sea.

The paper describes, at length, the nature of the building materials employed, the dressing of the stones, the composition of the mortar, the general detail and dimensions of the construction, the centreing of the arches, with the precautions used in striking them, and gives a very full account of the travelling and other cranes employed in the construction; these are stated to have been very efficient. The north arch, of 100 feet span, containing about 980 tons of stone, was entirely turned with two of the cranes, in 28 hours, giving an average weight of 17½ tons of stone laid by each crane per hour.

The perseverance and practical skill of Messrs. Gibb, of Aberdeen, the contractors, are particularly mentioned, as the difficulties attending the getting down the foundations, especially that of the main pier, were very great, and required all their talent and

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energy. The detail is given of the precautions taken with the coffer-dam, in which, at one period, a steam-engine of twenty-horses' power, working two pumps of 18 inches diameter each, was insufficient to keep down the water; and it became necessary to drive a range of sheet piling all round withinside the dam, before the leakage through the bad strata above the rock could be stopped.

By calculation it appears, that the pressure on the foundation of the highest pier in the bridge is about 37 tons on each square foot, exclusive of the additional weight of the passing coal-trains, which frequently weigh 120 tons each.

The bridge was commenced on the 17th of March, 1836, and was finished on the 28th of June, 1838, accupying about 714 working days, and cost, with the extra works, nearly £40,000.

The paper is illustrated by three drawings, showing a plan and elevation of the bridge in several stages of its construction, and when completed; the details of the centres, hoists, and cranes, the coffer-dam, engine, pumps, and of the foundations of the whole structure.

Mr. Vignoles had examined the bridge very minutely, and had been much struck with the excellence of the workmanship, which was quite in accordance with the beauty and simplicity of the original design; it was an extraordinary example of care and attention on the part of the contractors, and did infinite credit to all engaged in it; yet, with all this, it had cost less, in proportion to its dimensions, than any similar structure in this country.

The President observed, that the structure first proposed was to have been of cast-iron, but when he and his partner, Mr. Burges, were consulted, they advised the employment of the free-stone from the adjoining quarries, on Lord Londonderry's estate; and they furnished a design, based upon that of Trajan's bridge, at Alcantara, which was adopted by the directors; but subsequently an alteration was made, by introducing three small arches in each abutment, which, in his opinion, had injured the design; that was the extent of his connexion with the bridge; the merit of the construction must be given to the engineer and the contractors, and he must corroborate the statement of the superior manner in which the work had been executed. The bridge had been placed nearly at the spot marked out by Mr. Telford,

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for the Great North Road to cross the Wear; and as the railway would now form part of the line between Newcastle and Darlington, Mr. Telford's plan would be virtually executed, although with the difference of substituting a railway for a turnpike-road.

No. 551. "Description of the American engine 'Philadelphia,' made by Mr. Norris of Philadelphia, North America, for the Birmingham and Gloucester Railway."—By G. D. Bishopp; communicated by Captain W. S. Moorsom, Assoc. Inst. C. E.

THE engine, described in the paper, was made in the year 1840, and has been in regular work for upwards of two years as an assistant engine upon the Lickey inclined plane, which rises at an angle of 1 in 37½, and is 2 miles 4 chains long.

Its construction is what is termed a "Bogie" engine, having a four-wheeled truck, to support one end of the boiler, while the other end rests upon the driving wheels. It has outside cylinders, inclined so as to clear the bogie wheels, over which they are placed, and it has inside framing.

The boiler is cylindrical, 9 feet long and 3 feet 4 inches diameter, of plates ⅜-inch thick. The fire-box, attached to it, has three of its sides square, and the front semicircular, with a spherical dome on the top, and the area of the fire-grate about 10 square feet; it was originally constructed of iron, with water spaces 2½ inches wide, the crown being supported by stay bars in the usual manner, but it was destroyed in about eight months, and has been replaced by a copper fire-box, of plates ⅜-inch thick, with a tube plate ⅞-inch in thickness. The tubes are 94 in number, 8 feet 11 inches long, and 2 inches diameter outside; they were originally of copper, but were replaced by brass tubes when the new fire-box was fixed. Midway between the two end plates, is a third plate through which the tubes pass, so as to serve as a support, and to prevent them from sinking in the middle. The total internal area of the tubes is 404 square feet.

The chimney is 13¾ inches diameter internally, by 13 feet 10 inches high from the rails, and has not any damper.

The framing is entirely of wrought iron, with the axle guides, &c., forged upon it. The "bogie" frame is also of wrought iron; it is attached to the smoke-box by a centre pin, and is carried by two pair of wheels, 2 feet 6 inches in diameter, made of cast-iron, chilled, and without tires.

The driving wheels are 4 feet diameter, also of cast-iron, but

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with wrought-iron tires; they are firmly fixed upon a straight axle, as the cylinders are outside.

The cylinders are 12½ inches diameter inside, with a length of stroke of 20 inches.

Minute dimensions are given of the steam passage and valves, (the "lead" of which is ⅛-inch, and to the eduction pipe nearly ¼-inch, the motion of the slide extending 1 1/32 inch on either side of the centre line); the steam-chest, the regulator, the gearing, and feed-pumps, and all the other parts of the engine and connexions.

The general summary of the work done (the details of which are in the archives of the Institution of Civil Engineers) shows that with a maximum load of 8 waggons and 20 men, making a weight of 53½ tons behind the tender, the engine ascended the Lickey inclined plane, at a speed of between 8 and 9 miles per hour. That with 6 waggons, or 39½ tons, the speed was between 10 and 11 miles per hour; that with 5 waggons, or 33 tons, the speed increased to between 12 and 15 miles per hour, and that in assisting the ordinary trains, with 7 passenger carriages, the usual speed has been 13½ miles per hour.

There are three engines of this class kept at the Lickey inclined plane, for assisting the trains in their ascent, but one is generally found sufficient for the daily service.

The communication is illustrated by seven drawings of the engine, and its details of construction, which have been communicated through Captain W. S. Moorsom, Assoc. Inst. C. E.

Captain Moorsom, in answer to questions from members, explained that—

	Miles.	Chains.
The length of the Lickey incline, rising 1 in 37 4/10ths, was	2	4
The bank engine ran out from its house at the foot of the incline, at each trip, for a length of		14
And continued running at the head of the train after surmounting the incline, for about		23
Thus giving an actual length on the ascent of	2	41

And as the same distance was covered in returning, the length of each trip was rather more than 5 miles. This was exclusive of some occasional piloting and train trips, which were, however, included in the general statement of expenses.

The account of the entire expense of the bank engine establishment was made up of—1°, The wages of the drivers and firemen;

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2°, Cost of coke, oil and tallow; 3°, Repairs, including wages and materials; 4°, Depreciation of stock, stated at the end of each half-year; 5°, General charges, comprising wages of pumpers, cokemen, cleaners and labourers; cost of fire-wood, hose-pipes, cotton waste, and all other stores; salaries of superintendents, clerks, foremen, time-keepers, and store-keepers; and the premiums paid to the men for saving the coke.

The cost of working the incline plane was therefore, for each half-year, ending—

——	31st December, 1841.	30th June, 1842.	31st December, 1842.
	£. s. d.	£. s. d.	£. s. d.
Wages	132 7 11	95 9 10	117 14 8
Coke	324 13 6*	191 11 4†	165 19 0‡
Oil and Tallow	49 8 4	27 1 7	17 18 6
Repairs	245 1 0	260 3 8	92 6 11
General Charges....	237 19 7	93 15 7	76 6 11
	989 10 4	668 2 0	470 6 0
Depreciation of Stock	99 0 0	Nil, having been improved.	89 16 0
Total	1,088 10 4	668 2 0	560 2 0
Trips run	1,242	1,276	1,320
Miles run	6,210	6,380	6,600
Cost per mile run,—	s. d.	s. d.	s. d.
1st. Exclusive of Depreciation..	3 2¼	2 1	1 5
2nd. Including Depreciation..	3 6	0 0	1 8¼

* 27*s.* per ton. † 26*s.* 4*d.* per ton. ‡ 25*s.* 11½*d.* per ton.

The engines had been improved by the alterations made since their arrival in England. These changes chiefly consisted in suppressing the tender, and placing the receptacle for water and coke upon the boiler of the engine, and in using the waste steam to heat the water; these had increased the efficiency of the machine,

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and caused a considerable economy of fuel. All the other changes were of minor importance, and had been chiefly suggested by the exigencies of the peculiar locality where the engine worked. The economical working of the engine was due partly to the attention and skill of the driver, who had become better acquainted with the capabilities of the machine, had a better knowledge of the locality, and was stimulated by a premium upon the saving of coke and other stores consumed, but was principally to be attributed to the judicious alterations that had been made in the construction. There had not been any reduction of the men's wages.

The usual pressure of steam was between 60 lbs. and 66 lbs. per square inch.

The weights of the trains varied considerably; they rarely consisted of less than three carriages; the heaviest he remembered weighed 98 tons, exclusive of the weight of the two engines, which were employed to convey it up the incline.

He had not made any accurate experiments, as to the amount of slipping of the wheels upon the rails, but with the ordinary traffic he did not believe that any practical loss was occasioned by it.

Mr. Mc Connell stated that the pressure of steam in the boiler of the American engine, when the experiments were tried, was more than 70 lbs. per square inch; the spring balance was screwed down to 65 lbs. pressure, and as owing to the reduced speed of the engine, the steam was generated faster than it could be consumed by the cylinders, and thrown off by the safety valves, the pressure continued increasing. It should be understood that Bury's engine, alluded to in the experiments, was intended rather for conveying trains at higher velocities, than for mounting the incline with a heavy load; it was therefore labouring under a disadvantage. The steam ports in the American engine were very large, and although steam was thereby wasted, that arrangement was of material assistance, in the peculiar duty for which the machine was intended.

Mr. Braithwaite observed, that the quantity of coke consumed appeared to exceed materially that upon other railways; he understood that an engine recently constructed by Messrs. Rennie, used about 18 lbs. per mile, and that on the Liverpool and Manchester line, the average consumption was 16 lbs. per mile. It appeared to him that the real questions were,—the absolute duty performed with a given quantity of fuel, and at what cost? and

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also whether the greater adhesion of the driving wheels was due to the weight imposed upon the engine, by fixing the water tank upon the boiler, and the coke boxes upon the foot-plate, after suppressing the tender.

Mr. McConnell replied, that the peculiar duty of these bank engines required the steam to be kept up for about 16 hours daily, during which period they made eight trips, amounting in the whole to about 40 miles, of which, during 20 miles only actual duty was performed, so that the greater portion of the coke was consumed while the engines were at rest. When they were running with luggage trains on the line, the quantity of coke consumed was very small. The difference of cost, in consequence of the various alterations, and the improved mode of working the engine, was very great. In January 1842, the cost per trip on the incline was 17*s.* 5*d.*, but in January 1843, it only amounted to 7*s.* 1½*d.*

The average weight of the luggage trains was about 60 tons; two assistant engines were used for heavy trains, merely as a precaution, in case of the wheels slipping; otherwise one of the "Bogie" engines could perform the duty alone, as with the passenger trains, which were always conveyed up by the bank engine alone.

Captain Moorsom said that the main question arising from this investigation, was by what system steep gradients could be worked, with the greatest efficiency, security, and economy; he would, however, in the present case suppose the two former positions to be equal in both cases, and would inquire only into the economy.

It appeared from the returns of the London and Birmingham Railway Company, that the annual cost of working the Euston Square incline plane, which was 1⅛ mile long, with an average angle of 1 in 98, with stationary power and an endless rope, was,—

In 1840 - - -	- £2,150
1841 - - -	- 1,376
1842 - - -	- 1,215

On the Edinburgh and Glasgow Railway, the expenditure upon the Glasgow incline, which was about one mile in length, at an inclination of 1 in 42, also with stationary power, was £1,516. in 1842.

He had understood (but he could not produce authority for his statement) that, on the Great Western Railway, the cost of working the Box Tunnel incline alone, was, in 1841, about 3,500*l.*;

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and in 1842, it had been reduced to nearly 2,500*l.*; that was worked by locomotive power.

Taking into consideration the number and weight of the trains, their speed, and the relative length and the angle of the inclines, he believed that the Euston Square incline might be said to perform about half as much work as that on the Lickey.

Mr. Mc Connell presented drawings of the locomotive after being altered, of the detaching catch, and of the improved brake.

After detailing some important alterations made by him in the valves, as well as the substitution of a different description of fire-bars and fire-frame, under an arrangement by which a considerable saving had been effected in the consumption of fuel, he stated that, for several reasons, but chiefly to increase the adhesion of the driving wheels of the engine, the tender had been suppressed, and a large tank constructed to be carried on the boiler of the engine. It was made of the best plate iron, ¼-inch thick; its length was 8 feet 9 inches, breadth 3 feet 5 inches, depth 3 feet at the sides, and 1 foot 11 inches at the centre; the bottom was made to fit the form of the boiler, and was bedded upon a coating of thick felt; it was held in its place by four wrought-iron straps passing round the boiler.

Advantage had been taken of the waste steam, by introducing a copper pipe from the top of the fire-box dome, into the upper part of the tank, carrying it, to and fro, from one end to the other, with an open extremity to allow the escape of the steam into the water; this pipe was furnished with a stop-cock; in addition to this a number of pipes were introduced from the smoke-box into the tank, by which arrangement, the water in the tank was maintained at the boiling temperature, previous to being pumped into the boiler, which, in addition to the saving of fuel, proved advantageous in diminishing the leakage and breakage of the tubes and stays, arising from the sudden contraction by pumping in cold water, when the steam was shut off while descending the incline.

The tank contained upwards of 400 gallons of water, a quantity sufficient for the engine over 18 miles; and goods' trains had been taken the whole length of the line (53 miles), by these engines, with safety and economy.

The supply of coke was carried in sheet-iron boxes, each containing about 40 lbs. weight, and of a size to fit the fire-door of the boiler, ranged on platforms on each side of the foot-plate,

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which platforms were fitted with boxes, to hold the necessary tools required for the engines.

Mr. Mc Connell then described a powerful and efficient description of brake, which he had constructed to act upon the driving wheels; it was so arranged that the whole weight of the fire-box end of the engine could be thrown on the wheel tires; one brake had been found quite sufficient to stop the engine on any part of the incline; from their position they were very easily brought into action; the end working upon the fore part of the wheel, was connected to a stud made fast to the framing of the engine; the other end was worked by a screw $1\frac{3}{8}$ of an inch in diameter, passing through a bracket fixed on the boiler, which served as a nut. The main spring-plate of the brake was rendered flexible by the wood blocks being in short segments, thus enabling their entire surface to be brought into close contact with the periphery of the wheel.

A new form of catch, employed for detaching the engine from the train, was described; it was stated to be managed with facility, and at the same time was perfectly secure.

The principal advantages of these engines were, he believed, the economy in the consumption of fuel, and the increased adhesion of the driving wheels (the weight upon them being upwards of 10 tons, thus rendering the engine more effective in drawing heavy loads). The expenses of repairs had also been much decreased by the improvements suggested by practice.

The following statement showed the comparative consumption of coke at different periods, viz.—

For 6 months ending	June, 1841,	92·41 lbs. of coke per mile run.	
„	Jan. 1842,	86	„
„	June, 1842,	53·35	„
„	Jan. 1843,	43·2	„

March 7th, 1843.

The PRESIDENT in the Chair.

No. 596. "On the causes of the unexpected breakage of the Journals of Railway Axles; and on the means of preventing such accidents by observing the Law of Continuity in their construction."—By William John Macquorn Rankine, Assoc. Inst. C. E.

THE paper commences by stating that the unexpected fracture

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of originally good axles, after running for several years, without any appearance of unsoundness, must be caused by a gradual deterioration in the course of working; that with respect to the nature and cause of this deterioration, nothing but hypotheses have hitherto been given; the most accepted reason being, that the fibrous texture of malleable iron assumes gradually a crystallized structure, which being weaker in a longitudinal direction, gives way under a shock, that the same iron, when in its fibrous state, would have sustained without injury.

The author contends, that it is difficult to prove that an axle which, when broken, shall be found of a crystallized texture, may not have been so originally at the point of fracture, although at other parts the texture may have been fibrous.

He then proceeds to show that a gradual deterioration takes place in axles without their losing the fibrous texture, and that it does not arise from the cause to which it is usually attributed.

From among a large collection of faggoted axles which had broken, after running between two and four years, five specimens were selected, of which drawings are given, representing the exact appearance of the metal at the point of fracture, which in each case occurred at the re-entering angle, where the journal joined the body. The fractures appear to have commenced with a smooth, regularly-formed, minute fissure, extending all round the neck of the journal, and penetrating on an average to a depth of half an inch. They would appear to have gradually penetrated from the surface towards the centre, in such a manner that the broken end of the journal was convex, and necessarily the body of the axle was concave, until the thickness of sound iron in the centre became insufficient to support the shocks to which it was exposed.

In all the specimens the iron remained fibrous; proving that no material change had taken place in its structure.

The author then proceeds to argue, that the breaking of these axles was owing to a tendency of the abrupt change in thickness where the journal met the shoulder, to increase the effect of shocks at that point; that owing to the method of manufacture the fibres did not follow the surface of the shoulder, but that they penetrated straight into the body of the axle; that the power of a fibre to resist a shock, being in the compound ratio of its strength and extensibility, that portion of it which is within the mass of the body of the axle, will have less elasticity than that in the journal, and it is probable that the fibres give way at the shoulder, on ac-

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count of their elastic play being suddenly arrested at that point. This he contends would account for the direction of the fissure being inward towards the body of the axle, so that the surface of the fracture was always convex in that direction.

It is therefore proposed, in manufacturing axles, to form the journals with a large curve in the shoulder, before going to the lathe, so that the fibre shall be continuous throughout; the increased action at the shoulder would thus be made efficient in adding strength to the fibres, without impeding their elasticity. Several axles, having one end manufactured in this manner, and the other by the ordinary method, were broken: the former resisted from five to eight blows of a hammer, while the latter were invariably broken by one blow.

The vibratory action to which axles are subjected, is then considered, and it is contended, that at the place where there is an abrupt change in the extent of the oscillations of the molecules of the iron, these molecules must necessarily be more easily torn asunder; and that in the improved form of journals, as the power of resisting shocks is increased by the continuity of the superficial fibres, so is the destructive action of the vibratory movement prevented by the continuity of form.

The paper is illustrated by five drawings, showing the action of the journals of broken axles, and their appearance at the moment of fracture.

Mr. York agreed with Mr. Rankine in several points, and stated, that since the last meeting he had made a series of experiments, which confirmed his opinion relative to the vibration in solid railway axles being arrested, when the wheels were keyed on tight. In all such cases, where the vibration was checked, fracture would, he contended, be more likely to ensue, but with hollow axles there was very little difference of sound when struck, and no diminution of strength after keying on the wheels; this he attributed to the regular distribution of the molecules in the metal of the hollow cylinder.

Mr. Parkes coincided with Mr. York's opinion, and he believed that hollow axles would eventually supersede solid ones, particularly if they had sufficient rigidity for resisting flexure. Their faculty of transmitting vibration more readily was in their favor; it was well understood, that in pieces of ordnance and musket-barrels, great regularity of proportion in the metal was requisite,

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in order to insure the equal transmission of the vibration, caused by the sudden expansion of the metal at the moment of the explosion; and unless the vibration was regular, the barrel would burst, or the ball would not be correctly delivered.

Mr. Greener, of Newcastle, among other experiments, turned the outside of a musket-barrel to a correct taper, and fixed tight upon it at given intervals several rings of lead 2 inches in thickness; on firing a charge of 4 drachms of powder, he found that all the rings were loosened, and had all expanded regularly in their diameter.

It was a well-known fact that cannon seldom or never burst from continuous firing; such accidents, unless they arose from peculiar circumstances, generally occurred in consequence either of inequality in the nature of the metal or irregularity in its distribution; to the latter cause must be attributed the bursting of the "Mortier monstre" before Antwerp, and of a large gun which was proved at Deal some time since; this latter gun burst at the third discharge, after delivering the ball better than on either of the previous discharges; it was evident that the fracture did not occur under the explosion of the powder, but on the re-entering of the air into the mouth of the gun after the discharge, and also because the thickness of metal was not well-proportioned, whereby the vibration was unduly checked, the cohesion of the molecules of the metal was destroyed, and the gun fell into several pieces, without any of them being projected, as they would have been by the usual effect of an explosive force.

The most practical millwrights were well aware of the superioity of hollow shafts, and they were frequently used, as they were more easily kept cool than solid ones, especially at high velocities, when shafts were peculiarly liable to injury from percussive force or from a series of recurring vibrations.

ON THE LAWS RELATING TO LETTERS PATENT FOR INVENTIONS.

No. VII.

THE PATENT LAWS OF BAVARIA.

THE laws for the protection of inventive genius in Bavaria, are drawn up in much the same spirit as the Patent Laws of Prussia, and the strictures, in our last number, on the mal-administration

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of the latter, are equally applicable to Bavaria. The old adage of the blind leading the blind, is here illustrated, for, when the Government of Prussia refuse, from whatever cause, to grant a patent for any meritorious invention, their example is implicitly followed by the Bavarian administration, as also by most of the other German States, without the justice of that decision being so much as questioned. In consequence of this process of legislation being generally adopted, it is next to impossible for an inventor to obtain any protection, in Germany, for his improvements, as his first application for a patent must be made to the Prussian Government, and, when refused, the lesser states also reject the application.

The Patent Laws of Bavaria offer great encouragement to inventors, but practically they are hampered with many semi-official restrictions, for which we have not been able to find any authority. The principal difference between the Prussian and Bavarian Laws is, that whilst the former professes to grant patents for meritorious inventions *gratis*, the latter authorizes the imposition of a tax, varying, in each particular case, according to the nature and importance of the invention. We cannot, however, agree with this principle of charging, as we are convinced, that a uniform *fixed* tax would be more acceptable to the inventive community.

The first law in Bavaria, relating to patents, or exclusive privileges in the arts and manufactures, was enacted on 11th September, 1825. Patents were, however, granted before this time; all those in existence prior to this date were made subject, for their unexpired terms, to the regulations contained in this law. A further enactment, dated 15th August, 1834, made some alterations in the arrangements previously adopted, and a ministerial order, bearing date 28th December, 1835, was issued, for the purpose of explaining the new law, and insuring its application. This ministerial order is similar to a royal ordinance in France, and is issued for the more effectual putting in force of a new law.

The following Articles, (48 to 60 inclusive,) extracted from the ministerial order of 28th December, 1835, contain every thing relating to the granting of patents, or privileges as they are sometimes called :—

Conditions for obtaining a Patent.

Art. 48. Any person, the author of a discovery, invention, or improvement in any branch of arts or manufactures, or the im-

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porter of any article or manufacture, or of an improvement in industry, known abroad, but not in use in Bavaria, can obtain a patent upon the following conditions:—

1st. The demand, or petition, must be addressed to the Minister of the Interior, without any other outward explanation of its nature than a clear and positive indication of the subject of the patent.

To the petition must be attached a description of the discovery, invention, or improvement, in such complete and precise terms, that any expert person, by means of the method or process indicated in the description, may be able to execute or carry out the subject of the patent. In cases of patents of importation, the description must distinctly specify the particular point of novelty in the manufacture, or foreign improvement, and also point out the difference between the said improvement, compared with that which is practised at the time in Bavaria. Drawings, models, or specimens, must, if necessary, be furnished, so as to make the invention intelligible, and the difference between it and existing methods, perfectly understood.

Any inaccuracy of description, or the withholding of anything necessary for the perfect success of the process; or the insertion of any means that are unnecessary and useless; or want of sufficient clearness in description, whereby the novelty of the discovery, or invention, or its difference from known processes is not made perfectly evident, will endanger the validity of the patent.

2nd. The description should set forth the name, profession, and residence of the petitioner.—The title of the discovery, invention, or improvement, taken from its principal object, and the length of time for which the patent is required.

Upon the cover or envelope of the description, a memorandum is endorsed, setting forth the name or title of the invention, &c.; also the day and hour of the deposit thereof. A certificate is then delivered to the petitioner, which secures to him the exclusive use of the discovery or invention.

Every petition for a patent must be accompanied by a full description of the invention, and no preliminary or preparatory statement, having for its object, obtaining ultimately the exclusive use of any discovery, can under any pretence be accepted.

In case the endorsement upon the envelope, of the description, should be found defective, it may be rectified by the petitioner, even after the signature has been attached.

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ART. 49. The inferior authorities, in whose hands the petitions for patents are deposited, must not enquire, either about the quality of the petitioner, or the subject of his petition; and they are bound to forward it immediately to the Minister of the Interior, as a sealed packet; they will further be made responsible for any negligence, or for breaking the seals.

Advantages and Rights attached to Patents.

ART. 50. A patent secures to its possessor the exclusive use and operation of his discovery, &c., according to the terms of the description, and for the length of time which is therein mentioned.

ART. 51. The proprietor of the patent has the right (subject to the regulations of the police) to form the establishments necessary for putting the invention into operation; to extend its operation in any convenient manner; to employ such means and processes as he may consider desirable; to establish warehouses or depôts for his goods; to form partnerships; to transfer or sell the whole or part of his patent, in the manner prescribed by law. —Every transfer of a patent must be notified to the Minister of the Interior.

ART. 52. A patent of improvement gives no exclusive right to the proprietor over the original object to which the improvement applies; and when the original object is the subject of a prior patent, the proprietor of the latter improvement can have no right or power over the former.

ART. 53. The manufacture or sale of any patented article, without the consent of the proprietor of the patent, is an infringement upon his rights, and he is empowered to institute an action before the proper authorities, for the purpose of stopping the infringement, and obtaining the seizure (provisionally) of such articles as form the subject of his patent, whether they be found on the premises of the manufacturer, or those of a third party to whom he has forwarded them; or whether they have been imported from a foreign country.

Commencement, Duration, and Expiration of Patents.

ART. 54. The longest term for which patents shall be granted, is fixed at fifteen years; it commences from the day of depositing the title; an action cannot however be commenced by the proprietor of the patent, against any infringer, until after the day of its publication in the official gazette.

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ART. 55. The patent expires or becomes void, both as regards the original proprietor, as well as his assignees or licencees;—

1st. If the operation or working of the patent, or the articles produced by it, be considered as contrary to the interest of the state, or injurious to the public health or interest.

2nd. If there be legal proof that the discovery or invention was known or described, anterior to the day and hour of the deposit of the description; and that in one or the other case, it had been put to work in the kingdom; or if the proprietor of a former patent can shew the invention or discovery, patented afterwards, is identical with his own.

3rd. If the description given by the inventor, or proprietor, does not fulfil the conditions settled in Art. 48, No. 1, for the validity of the patent.

4th. If the proprietor of the patent does not comply with the special obligations imposed on him, upon the delivery of the title, and if he does not pay into the Treasury the second instalment of the tax; or if, in case of a transfer, the purchaser neglects the regulation mentioned in Art. 51.

ART. 56. In order to give inventors every opportunity of experimenting upon their inventions, patents may be obtained for a shorter term than that determined by the law as the maximum; and inventors are allowed to obtain a prolongation of their patents, to the term of fifteen years, provided a declaration and petition to that effect, be presented before the expiration of the first patent. If the declaration is not made in time, the patent lapses by the expiration of the term for which it was originally granted.

ART. 57. Patents are subject to the payment of a tax, according to each particular case; one half of which tax must be paid upon delivering in the title, and the remainder within the three months following the expiration of the first half of the term for which the patent is granted; in default of which payment, the patent will be cancelled, as mentioned in Art. 55, No. 4.

When a patent is annulled before the expiration of its term, no part of the tax paid can be returned, unless the forfeiture is occasioned by some considerations of public order.—Art. 55, No. 1.

The amount of the taxes received, is sent every three months to the Minister of the Interior, by the provincial authorities, accompanied by a list of those patents upon which the tax has been paid. The Minister of the Interior orders this statement to be published in the official journal.

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On Registering the Patents, and the Publication of the Inventions.

Art. 58. In order to give the greatest publication, and assist inventors as much as possible, a register must be kept constantly open for public inspection, upon which all patents granted are inscribed with the names of the proprietors, their real or chosen place of residence; the day and hour of the deposit of the specification; the date of the delivery and the duration of the patent, as well as all the changes of proprietors, together with any forfeitures that have taken place during the time fixed for the duration of the patents.

Art. 59. Extracts from this register must be inserted periodically in the gazettes of the most extensive circulation, in the scientific journals, and in the advertising sheets of the provinces. The Minister of the Interior must also take care that the most extended publication is given to the specifications, or descriptions of all inventions which are the subjects of patents, immediately after the expiration of the first three years, from the day of the publication of the grant of the patent; in order to contribute as much as possible to the encouragement of the spirit of invention, and the extension of the arts and manufactures.

This publication of the inventions or discoveries, &c., in the manner above mentioned, cannot be deferred by the Minister of the Interior, except in extraordinary cases, and for very urgent and adequate causes; as the patent sufficiently protects the proprietor against infringement, and the violation of his privileges.

In addition to the above, the ordinance of the 15th of August, 1834, contains an article relative to the issue of patents of importation.—It enacts, that in cases of demands for patents of importation, for discoveries or improvements, applicable to the arts or manufactures carried on in Bavaria, such patents cannot be granted, unless the discovery or improvement be the subject of a patent in a foreign country; this grant is limited to fifteen years.

Petitions for patents of inventions, already protected in one of the states of the Customs Union, and presented by some party, not the proprietor of the patent, in the said state, will be subject to the general or particular arrangements which have been, or will be hereafter, entered into with the said states; and the tax to be paid, will be in proportion to the importance of the invention, and to the duration of the patent.

In relation to actions of infringement, the police authorities

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are empowered not only to confiscate the goods, and forbid the manufacture of articles made in defiance of a patent, but also to inflict a fine of from 100 to 500 florins; one half of which is given to the proprietor of the patent, and the other deposited in the poor-box of the district where the infringement takes place; and when any party considers himself aggrieved by the decision of the police authorities, he may appeal to a higher tribunal, within fourteen days; but if this time be allowed to elapse, the appeal cannot be admitted.

AN ACT TO AMEND THE LAWS RELATING TO THE COPYRIGHT OF DESIGNS.

DURING the Session of Parliament which is just concluded, another Act has been passed, for protecting the configuration of certain articles of manufacture. This Law, it would seem, was called for by the imperfections of the Act, 2 Vict., cap. 17, (for securing to proprietors of designs, for articles of manufacture, the copyright of such designs for a limited time,) as it raised a spurious protection for all sorts of articles,—barrel-organs and chimney-pots having been registered under that Act, without the Registrar possessing the power, as he conceived, of refusing them.

The Act, which was passed last year, being clearly defined, as embracing nothing but purely ornamental devices, many ingenious contrivances were left (the former Act being repealed) without even the semblance of protection. It was therefore found expedient to pass a new law, whereby designs for *articles of utility* might be secured, in like manner, to ornamental devices. The substance of this Act is given below, but no very clear opinion can, at present, be formed of the range of subjects it will embrace. It remains to be seen what interpretation will be given to the second clause by the Registrar, as, in the event of an outward configuration only, being secured, little protection will be given to ingenuity; whereas, if *construction* also, be contemplated, (which it would appear is intended, by drawings of the design being ordered, in clause VIII., to be made on a proper geometrical scale, and accompanied with a description, to render the same intelligible,) then this Act will infringe on the prerogative of the Crown, and give nothing less than a three years'

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patent to a certain class of subjects, while chemical improvements will be left, as at present, to the costly protection of a fourteen years' patent.

We anxiously await the practical development of this Act, feeling, as we do, that however competent the Registrar may be to approve or refuse the designs which will be brought under his notice,—such an influx will be the consequence of a knowledge of the existence of this Act, that it will be impossible to devote anything like the necessary time to their consideration.

The following is an abstract of the new law:—

"WHEREAS by an Act passed in the fifth and sixth years of the reign of her present Majesty, intituled *An Act to consolidate and amend the Laws relating to the Copyright of Designs for ornamenting Articles of Manufacture*, there was granted to the proprietor of any new and original design, with the exceptions therein mentioned, the sole right to apply the same to the ornamenting of any article of manufacture or any such substance as therein described, during the respective periods therein mentioned: and whereas it is expedient to extend the protection afforded by the said act to such designs hereinafter mentioned, not being of an ornamental character, as are not included therein: Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, that this Act shall come into operation on the first day of *September*, One thousand eight hundred and forty-three."

"II. And with regard to any new or original design, for any article of manufacture having reference to some purpose of utility, so far as such design shall be for the shape or configuration of such article, and that whether it be for the whole of such shape or configuration or only for a part thereof, be it enacted, that the proprietor of such design, not previously published within the United Kingdom of *Great Britian* and *Ireland* or elsewhere, shall have the sole right to apply such design to any article, or make or sell any article according to such design, for the term of three years, to be computed from the time of such design being registered according to this Act: provided always, that this enactment shall not extend to such designs as are within the provisions of the said Act, or of two other Acts passed respectively in the thirty-eighth and fifty-fourth years of the Reign of his late Majesty King *George* the Third, and intituled respectively *An Act for en-*

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couraging the Art of making new Models and Casts of Busts, and other things therein mentioned, and *An Act to amend and render more effectual an Act for encouraging the Art of making new models and Casts of Busts, and other things therein mentioned.*"

"III. Provided always, and be it enacted, that no person shall be entitled to the benefit of this Act unless such design have before publication thereof, been registered according to this Act, and unless the name of such person shall be registered according to this Act as a proprietor of such design, and unless after publication of such design, every article of manufacture made by him according to such design, or on which such design is used, hath thereon the word 'registered,' with the date of registration."

"IV. And be it enacted, that unless a design applied to any article of manufacture be registered either as aforesaid or according to the provisions of the said first-mentioned Act, and also after the copyright of such design shall have expired, it shall be unlawful to put on any such article the word 'registered,' or to advertise the same for sale as a registered article; and if any person shall so unlawfully publish, sell, or expose, or advertise for sale any such article of manufacture, he shall forfeit for every such offence, a sum not exceeding five pounds nor less than one pound, which may be recovered by any person proceeding for the same by any of the remedies hereby given for the recovery of penalties for pirating any such design."

The absurdity of this clause can be only equalled by a provision in an Act lately passed by the American Congress, in which, under a heavy penalty, all persons manufacturing a patented article, are bound to engrave or stamp the word "patent," visibly upon it; such, for instance, as on a pin or needle; and by Clause IV., it will be seen, that shop-keepers, upon selling off any old stock, which may have been registered, and the period of protection elapsed, will be subject to a heavy fine, unless the obnoxious word "registered" be obliterated.

"V. And be it enacted, that all such articles of manufacture as are commonly known by the name of floor-cloths or oil-cloths, shall henceforth be considered as included in class six in the said first-mentioned Act, in that behalf mentioned, and be registered accordingly."

Section VI. refers to certain provisions of the Act 5 and 6, Vic. c. 100, relating to the recovery of penalties, limitation of action, and costs of registration, and which are made to apply equally to this Act.

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Section VII. relates to the appointment of a Registrar, Assistant Registrar, and the other necessary officers and servants, together with their salaries.

"VIII. And be it enacted, that the said Registrar shall not register any design for the shape or configuration of any article of manufacture as aforesaid, unless he be furnished with two exactly similar drawings or prints of such design, with such description in writing as may be necessary to render the same intelligible, according to the judgment of the said Registrar, together with the title of the said design, and the name of every person who shall claim to be proprietor, or of the style or title of the firm under which such proprietor may be trading, with his place of abode, or place of carrying on business, or other place of address; and every such drawing or print, together with the title and description of such design, and the name and address of the proprietor aforesaid, shall be on one sheet of paper or parchment, and on the same side thereof; and the size of the said sheet shall not exceed twenty-four inches by fifteen inches; and there shall be left on one of the said sheets a blank space on the same side on which are the said drawings, title, description, name, and address, of the size of six inches by four inches, for the certificate herein mentioned; and the said drawings or prints shall be made on a proper geometric scale; and the said description shall set forth such part or parts of the said design (if any) as shall not be new or original; and the said Registrar shall register all such drawings or prints from time to time, as they are received by him for that purpose; and on every such drawing or print he shall affix a number corresponding to the order of succession in the register, and he shall retain one drawing or print, which he shall file at his office, and the other he shall return to the person by whom the same has been forwarded to him; and in order to give a ready access to the designs, so registered, he shall keep a proper index of the titles thereof."

"IX. And be it enacted, that if any design be brought to the said Registrar to be registered under the said first-mentioned Act, and it shall appear to him that the same ought to be registered under this present Act, it shall be lawful for the said Registrar to refuse to register such design, otherwise than under the present Act, and in the manner hereby provided; and if it shall appear to the said Registrar that the design brought to be registered under the said first-mentioned Act, or this Act, is not intended to be applied to any article of manufacture, but only to some label,

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wrapper, or other covering in which such article might be exposed for sale, or that such design is contrary to public morality or order, it shall be lawful for the said Registrar, in his discretion, wholly to refuse to register such design: provided always, that the Lords of the said Committee of Privy Council may, on representation made to them by the proprietor of any design, so wholly refused to be registered as aforesaid, if they shall see fit, direct the said Registrar to register such design, whereupon and in such case the said Registrar shall be and is hereby required to register the same accordingly."

"X. And be it enacted, that every person shall be at liberty to inspect the index of the titles of the designs, not being ornamental designs, registered under this Act, and to take copies from the same, paying only such fees as shall be appointed by virtue of this Act in that behalf; and every person shall be at liberty to inspect any such design, and to take copies thereof, paying such fee as aforesaid; but no design, whereof the copyright shall not have expired, shall be open to inspection, except in the presence of such Registrar, or in the presence of some person holding an appointment under this Act, and not so as to take a copy of such design, nor without paying such fee as aforesaid."

The following is the Table of Fees, as settled by the Commissioners of the Treasury.

	STAMP. £	s.	d.	FEE. £	s.	d.	TOTAL. £	s.	d.
Registering Design	5	0	0	5	0	0	10	0	0
Certifying former Registration	5	0	0	1	0	0	6	0	0
Registering and Certifying Transfer	5	0	0	1	0	0	6	0	0
Cancellation or Substitution				1	0	0	1	0	0
Inspecting Index of Titles				0	1	0	0	1	0
Inspecting Designs (expired Copyrights) each vol.				0	1	0	0	1	0
Taking Copies of ditto, each Design				0	2	0	0	2	0
Inspecting Designs (unexpired Copyrights), each Design				0	5	0	0	5	0

CHARGE OF PIRATING A "DESIGN."

At the Stockport Borough Court.

BEFORE J. THORNHILL, C. BAKER, AND T. WALMSLEY, ESQRS.

AN information, under the Copyright of Designs Act, was exhibited by Mr. Abraham Evans, of Oldham, "that *Robert Harlow*,

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of the Borough of Stockport, brass founder, and manufacturer of brass work, did on the 8th day of July, publish or sell or expose for sale, or barter, a certain article of manufacture in brass called an 'improved lubricator,' in imitation and as representing, or intending to represent a certain registered design of the said informant, and known as 'the self-acting tallow syphon or lubricator,' and duly registered in the office of Registrar of Designs as "Evans' improved form of grease cock for lubricating machinery," &c.

Mr. R. J. HALSALL, solicitor of Middleton, conducted the case for the informant, and Mr. W. VAUGHAN appeared for Mr. Harlow.

Mr. HALSALL having opened the case with some remarks as to the protection which the new Act of Parliament afforded, proceeded to point out the law affecting cases of this description, the penalty of which was £30 or not less than £5. The proceedings were two-fold, either by action in a higher Court or before two magistrates. By the second section of the first clause of the Act, there was a protection "for the modelling, or the casting, or for any other kind of impression or ornament, on any article of manufacture." The sale or publication of any such design, without the consent of the proprietor, after being duly registered, subjects the party to a penalty. Mr. John Davies, a civil engineer of Manchester, and agent for the office of patents, proved the registration of Mr. Evans' design, No. 1402, styled "Evans' improved form of grease cock for lubricating machinery." He was also examined as to the construction of the brass cock, alleged to be an infringement and manufactured by Mr. Harlow, and the one from the original design, the property of Mr. Evans. The former he said embraced the whole of the design, with some small additions. The most striking difference was—there was a valve in the defendant's, and none in the other. He admitted the interior construction of the two varied slightly; as well as the external configuration. Mr. Evans' was of an elliptical shape, and Mr. Harlow's was spherical; but none of these variations were important, the detail and the mechanical arrangements being the material portions. He had nothing to do with the merits of the imitation; but in his opinion, the valve was more detrimental than otherwise. The screw, which conceals the holes of the bottom in the defendant's, was merely done to deceive the public. John Brelsford proved the purchase of the lubricator on the 8th July, from Mr. Harlow's shop, for £1, having been sent thither by Mr.

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Evans. The identity of the article having with some difficulty been supplied by policeman Longson, the case closed.

Mr. W. VAUGHAN then addressed the Court for the defence, the gist of whose argument was to dispute the jurisdiction of the magistrates in the matter. The Act of Parliament upon which these proceedings had been grounded, was passed for the purpose of protecting certain copyrights which were not patented. It referred to invented patterns or impressions; and, before the magistrates could convict, they must be satisfied that the alleged infringement was a perfect imitation of the original design "for the modelling or the casting, or the embossing," &c., upon which Mr. Halsall had founded his case. This brass lubricator was not "a design or ornament," &c., contemplated by the statute, whilst the configuration and construction of both inventions (according to the evidence of Mr. Davies) were different. Therefore Mr. Harlow was not, under this information, within the cognizance of the Bench, and therefore not subject to the penalty. The Magistrates retired for a short period. Mr. THORNHILL said, "the Magistrates do not consider the case as proved to be within the Act of Parliament. There are three provisions of the Act of Parliament in the first section. The first is, as to pattern or print, to be worked on a manufacture. The second is, as to the modelling, casting, embossing, chasing, engraving, or impressing an ornament on any manufacture, not being a tissue or textile fabric. And the third, as to the shape or configuration of any article of manufacture, lace, &c. excepted. These only are the designs which can be registered under the Act in question. Now, does this subject-matter of complaint come within any of these three? The complainant admits the first and third do not help him. Does the second? Is it either the modelling, casting, embossing, chasing, engraving, or impressing any ornament on any manufacture, not being a tissue or textile fabric? We think not, and therefore dismiss the case. We do this with the greater satisfaction, knowing that if such decision be wrong, the complainant may bring his action, but in our opinion the Act of Parliament does not meet the exigencies of the present case." The information against Mr. Harlow was dismissed accordingly. Mr. Evans then signified his intention of trying the question in a superior Court.

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List of Patents

Granted by the French Government from the 1st of January to the 31st of March, 1841.

PATENTS FOR FIVE YEARS.

(Continued from Page 68, Vol. XXIII.)

To Poulaine, of Paris, for improvements in gas-burners.
Proeschel, of Paris, for a mechanical chair.
Rapp, of Paris, for a process for rendering leather water-proof.
Saint-Eve, of Besançon, for an application of cast-iron to the making of balusters of stairs.
Servelly, of Nimes, for improvements on the Jacquard frame.
Sormani, of Paris, for an improved piano.
Souffrant, of Paris, for improved axletrees and boxes.
Thomas, of Paris, for improvements in shoes.
Trousset, Catala, and Co., of Angouleme, for a steam apparatus for preparing rags, used in the manufacture of paper.
Villiond, of Lyons, for improvements in the winding of silk.
Werdet, of Paris, for oil for curling the hair.
Zegelaar, of Paris, for the destruction of bugs and their eggs.

Patents granted from the 1st of April to the 31st of June, 1841.

PATENTS FOR FIFTEEN YEARS.

Boussac, represented in Paris by M. Perpigna, advocate of the French and Foreign Office for Patents, 2 ter: Rue Choiseul, for a machine to be worked by gas.
Ferguson and Bornéque, represented by M. Perpigna, advocate, for improvements in looms.
Granad, of Trebes, represented by M. Perpigna, advocate, for a cylindrical press.
Jallasson, of Paris, represented by M. Perpigna, advocate, for a machine for ruling paper.
Maitre, represented in Paris by M. Perpigna, advocate, for improvements in ovens.
Baroil, of Paris, for a key for turning screws.
Bernard, of Avignon, for an imitation of marble.
Besson, Casson, Goberk, and Desgaultières, of Lyons, for a new motive power.
Boucherie, of Bordeaux, for a process for preserving and coloring wood.
Camu and Croutelle, of Rheims, for improvements in the spinning of wool.

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Demoussy, of Paris, for an improved varnish.
Dubosc Brother, of Rouen, for improvements in printing tissues.
Duncan, of London, for a machine for making nails.
Durand de Monestrol, of Paris, for a diving machine.
De Fonvielle, of Paris, for a process of rendering whale oil fit for lamps.
Gigou, Cavetier, and Co., of Metz, for a tambour frame.
Heilmann, of Mülhausen, for a machine for weaving and cutting woollen cloths and velvets.
Hurel, of Paris, for an improved propeller.
Paris and Denon, of Paris, for improvements in copper-plate impressions.
Mesmin Laloyaux, of Paris, for a new motive power.
Perard, of Paris, for the purifying of animal oil.
Philippe, of Paris, for a machine for making inlaid floors.
Robertson, of London, for improvements in mills.
Schwickardi, of Passy, for improved motive power.
Vassal, of Aine, for improvements in soap.
Vinay, of Pondichery, for extracting sugar from the palm tree.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th July, 1843, to the 17th of August, 1843, inclusive.

To John Hutcheson, flax grower, and James Edgar, carpenter, both of Killycairn, near Market-hill, in the county of Armagh, for improved machinery, which may be worked by water, steam, or any other propelling power, for breaking and scraping flax, on a system entirely new, without danger to human life; whereby the flax is greatly improved and cleaned in a very superior manner, and the value of it much enhanced.—Sealed 10th August.

Christopher Nickels, of York-road, Lambeth, in the county of Surrey, Gent., for improvements in the manufacture of plaited fabrics.—Sealed 12th August.

Charles Payne, of South Lambeth, in the county of Surrey, chemist, for improvements in preserving vegetable matters, when metallic and earthy solutions are employed.—Sealed 12th August.

Sir John Scott Lillie, of Chelsea, in the county of Middlesex, Knt., for certain improvements in roads.—Sealed 17th August.

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Thomas Cardwell, of Bombay, in the East Indies, merchant, for improvements in the construction of presses for compressing cotton and other articles.—Sealed 17th August.

List of Patents

Granted for SCOTLAND, subsequent to July 22nd, 1843.

To Thomas Oldham, of Manchester, manufacturer, for a certain improved mode of manufacturing bonnets and hats.—Sealed 24th July.

George Parsons, of West Lambrook, near South Petherton, Somersetshire, for a portable roof for various agricultural and other purposes.—Sealed 26th July.

Samuel Ellis, of Salford, Manchester, engineer, for certain improvements in weighing machines, and in turn-tables, to be used on or in connection with railways, and in weighing machines to be used in other situations.—Sealed 3rd August.

Charlton James Wollaston, of Welling, in the county of Kent, for improvements in machinery for cutting marble and stone,—being a foreign communication.—Sealed 3rd August.

Ernest Lentz, of Eastcheap, London, for improvements in machinery for raising and forcing water and other fluids, which machinery, when worked by steam or water, may be employed for driving machinery,—being a foreign communication.—Sealed 3rd August.

Edmund Morewood, of Thornbridge, Derbyshire, merchant, and George Rogers, of Chelsea, London, for improved processes for coating metals.—Sealed 8th August.

Francis Roubiliac Conder, of Highgate, London, civil engineer, for improvements in the cutting and shaping of wood, and in the machinery for that purpose,—being a foreign communication.—Sealed 9th August.

Thomas Earl of Dundonald, of Regent's Park, London, for improvements in rotatory or revolving engines, and in apparatus connected with steam-engines and in propelling vessels.—Sealed 10th August.

Samuel Eccles, of Hulme, machinist, and Matthew Curtis, of Chorlton-upon-Medlock, machinist, for certain improvements in looms for weaving.—Sealed 10th August.

Fennel Allman, of Salisbury-street, London, surveyor, for certain improvements in apparatus for the production and diffusion of light.—Sealed 14th August.

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William Bates, of Leicester, fuller and dresser, for improvements in the dressing and getting-up of hosiery goods and other looped fabrics, made from merino, lambs'-wool, worsted, cotton, silk, and other yarns.—Sealed 14th August.

John Laird, of Birkenhead, in the county of Chester, ship-builder, for improvements in the construction of steam and other vessels. Sealed 16th August.

Gregory Seale Walters, of Coleman-street, London, merchant, for improvements in the manufacture of chlorine and chlorides, and in obtaining the oxides and peroxides of manganese in the residuary liquids of such manufacture,—being a foreign communication.—Sealed 16th August.

John Barnes, of Church, Lancashire, manufacturing chemist, and John Mercer, of Oakenshaw, in the said county, calico printer, for certain improvements in the manufacture of articles used in printing and dyeing cotton, silk, woollen, and other fabrics, —Sealed 19th August.

John Burns Smith, late of Salford, but now of Stockport, cotton spinner, for certain improvements in machinery for preparing, carding, roving, and spinning cotton, and other fibrous substances.—Sealed 21st August.

James Overend, of Liverpool, for improvements in printing fabrics with metallic matters, and in finishing silk and other fabrics,—being a foreign communication.—Sealed 22nd August.

New Patents
SEALED IN ENGLAND.
1843.

To William Davey, of Bath, slate merchant, for certain improvements in covering the ridges and hips of roofs of buildings with slate and other materials. Sealed 31st July—6 months for inrolment.

Charlton James Wollaston, of Welling, in the county of Kent, Gent., for improvements in machinery for cutting marble and stone. Sealed 1st August—6 months for inrolment.

Peter Borrie, of Princes-square, Saint George's in the East, engineer, and Mayer Henry, of Crutched Friars, merchant, for certain improvements in steam-engines, boilers, and propelling machinery. Sealed 3rd August—6 months for inrolment.

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Frederick Steiner, of Hyndburn Cottage, Lancaster, Turkey-red dyer, for a new manufacture of a certain coloring matter, commonly called Garancine,—being a communication. Sealed 8th August—6 months for inrolment.

James Home, of Regent's Park, Esq., for improvements in the manufacture of horse-shoes. Sealed 8th August—6 months for inrolment.

Charles Bourjot, of Coleman-street, London, merchant, for improvements in apparatus for obtaining the profile of various forms or figures,—being a communication. Sealed 8th August —6 months for inrolment.

Richard Archibald Brooman, of 166, Fleet-street, Gent., for the manufacture of paper, cordage, matting, and other textile fabrics, from certain vegetable matters not heretofore made use of for that purpose; as also for the application of the said materials to the stuffing of cushions and mattrasses. Sealed 10th August—6 months for inrolment.

John Wood, of Parkfield, Chester, merchant, for certain improvements in machinery or apparatus for affording additional or artificial buoyancy to sea-going and other vessels, or for lessening their draught of water; and which said improvements are also applicable to raising vessels or other heavy bodies, and for securing or supporting the same. Sealed 14th August—6 months for inrolment.

Archibald Horn, of Aldersgate-street, zinc-worker, for improvements in the construction of shutters for windows, and for other purposes. Sealed 15th August—6 months for inrolment.

George Bennetts, of Gunnis Lake, Cornwall, civil engineer, for improvements in steam-engines and boilers, and in generating steam. Sealed 15th August—6 months for inrolment.

Thomas Young, of Queen-street, London, merchant, for improvements in obtaining power. Sealed 15th August—6 months for inrolment.

James Brown, of No. 2, High-street Place, White-horse Lane, Stepney, Esq., engineer, for certain improvements in tackle and apparatus for working and using chain cables in ships and otherwise; and also certain improvements in the tillers of rudders of ships and other vessels. Sealed 16th August—6 months for inrolment.

Frederick Lipscombe, of University-street, Gent., for an hydrostatic engine, parts whereof are applicable as improvements to other engines, and other purposes; and also improvements in

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railway carriages. Sealed 17th August—6 months for inrolment.

John Charlton, of Birmingham, factor, for certain improvements in castors for furniture. Sealed 17th August—6 months for inrolment.

John Collard Drake, of Elm Tree Road, Saint John's Wood, land-surveyor, for improvements in lining walls of houses. Sealed 22nd August—6 months for inrolment.

Mark Freeman, of Sutton, Surrey, Gent., for improvements in card-cases. Sealed 22nd August—6 months for inrolment.

Gaspare Conti, of Sherrard-street, Golden-square, Gent., for improvements in hydraulic machinery, to be applied as a motive power. Sealed 22nd August—6 months for inrolment.

William Wilson, John Studholme Brownrigg, John Cockerell, and Sir George Gerard de Hochepied Larpent, Baronet, all of Belmont, in the Wandsworth Road, patent cocoa-nut, candle, and oil manufacturers, and cocoa-nut oil merchants, assignees of a patent granted by his late Majesty King George the Fourth unto James Soames, Junior, of Wheeler-street, Spitalfields, soap-maker, for a new preparation or manufacture of a certain material produced from a vegetable substance, and the application thereof to the purposes of affording light, and other uses, for the term of three years from the ninth day of September next, the expiration of the original patent. Sealed 24th August.

William Fletcher, of Morton House, Buckingham, clerk, for certain improvements for the purpose of securing corks, or substitutes for corks, in the mouths of bottles or vessels of the nature of bottles, whether made of pottery or of pottery of the kind called stone-ware, or of glass. Sealed 24th August—6 months for inrolment.

Alexander Connison, of Everett-street, Brunswick-square, engineer, for improvements in steam-engines. Sealed 24th August.*

Bryan Corcoran, of Mark Lane, London, merchant, for certain improvements in the grinding of wheat and other substances, —being a communication. Sealed 25th August—6 months for inrolment.

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* This patent, being opposed at the Great Seal, was not sealed till the 24th August, but bears date the 3rd March, 1843, per order of the Lord Chancellor; and the Specification must be enrolled six months after this date.

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CELESTIAL PHENOMENA FOR SEPTEMBER, 1843.

D.	H.	M.	
1			Clock after the sun, 0m. 0s.
	—		☽ rises 2h. 25m. A.
	—		☽ passes mer. 6h. 15m. A.
	—		☽ sets 10h. 6m. A.
	5	22	☽ in □ or first quarter.
	17	41	☌ in conj. with the ☽ diff of dec. 2. 38. S.
3			Occul Sagittarii, im. 11h. 33m. em. 12h. 26m.
3	20	24	♄ in conj. with the ☽ diff. of dec. 1. 50. S.
5			Clock after the sun, 1m. 36s.
	—		☽ rises 5h. 24m. A.
	—		☽ passes mer. 10h. 33m. A.
	—		☽ sets 2h. 42m. M.
	10	24	♃'s first satt. will em.
6	7	34	♃'s second satt. will em.
6	8	31	♃ in conj. with the ☽ diff. of dec. 5. 24. S.
7			Occul *k* Aquarii, im. 15h. 57m. em. 16h. 54m.
8	6	57	Ecliptic oppo. or ○ full moon
9	18	33	♅ in conj. with the ☽ diff. of dec. 6. 17. S.
10			Clock after the sun, 2m. 58s.
	—		☽ rises 6h. 30m. A.
	—		☽ passes mer. 0h. 40m. M.
	—		☽ sets 7h. 19m. M.
	2	43	☿ in Aphelion
11	19		☽ in Apogee
12	12	19	♃'s first satt. will em.
12	14	25	☿ in conj. with Vesta, diff. of dec. 7. 18. S.
13			Occul ♈ Arietis, im. 16h. 30m. em. 17h. 29m.
13	10	9	♃'s second satt. will em.
14	6	48	♃'s first satt. will em.
15			Clock after the sun, 4m. 42s.
	—		☽ rises 8h. 46m. A.
	—		☽ passes mer. 4h. 42m. M.
	—		☽ sets 0h. 47m. A.
16	11	13	☽ in □ or last quarter
17	14	56	♀ greatest Hel. Lat. N.
18			Mercury R. A. 13h. 13m. dec. 10. 27. S.
	—		Venus R. A. 11h. 29m. dec. 4. 49. N.
	—		Mars R. A. 18h. 4m. dec. 26. 27. S.
	—		Vesta R. A. 13h. 1m. dec. 1. 13. S.
	—		Juno R. A. 21h. 4m. dec. 9. 26. S.
18			Ceres R. A. 12h. 14m. dec. 6. 36. N.
	—		Pallas R. A. 11h. 53m. dec. 3. 32. N.
	—		Jupiter R. A. 21h. 26m. dec. 16. 18. S.
	—		Saturn R. A. 19h. 23m. dec. 22. 10. S.
	—		Georg. R. A. 0h. 3m. dec. 0. 30. S.
	—		Mercury passes mer. 1h. 26m.
	—		Venus passes mer. 23h. 43m.
	—		Mars passes mer. 6h. 17m.
	—		Jupiter passes mer. 9h. 37m.
	—		Saturn passes mer. 7h. 35m.
	—		Georg. passes mer. 12h. 14m.
19	6	52	♃'s fourth satt. will im.
19	11	34	♃'s fourth satt. will em.
19	21		☌ greatest Hel. Lat. S.
20			Occul *h* Leonis, im. 16h. 4m. em. 16h. 31m.
20			Clock after the sun, 6m. 28s.
	—		☽ rises 1h. 2m. M.
	—		☽ passes mer. 8h. 43m. M.
	—		☽ sets 4h. 8m. M.
	4	57	☿ greatest elong. 26. 13. E.
	12	44	♃'s second satt. will em.
21	8	44	♃'s first satt. will em.
22	10	3	Pallas in conj. with the ☉
23	5	10	☉ enters Libra,—Autumn commences
	10	53	Ecliptic conj. or ● new moon
	11	40	♀ in conj. with the ☽ diff. of dec. 6. 58. N.
	12	42	♅ oppo. to the ☉
	13	8	♄ stationary
24	9		☽ in Perigee
25			Clock after the sun, 8m. 12s.
	—		☽ rises 8h. 6m. M.
	—		☽ passes mer. 1h. 9m. A.
	—		☽ sets 6h. 1m. A.
	6	44	☿ in conj. with the ☽ diff. of dec. 1. 10. N.
27	0	53	♀ in conj. with Pallas, diff. of dec 2. 31. N.
28			Occul *u* Ophiuchi, im. 6h. 34m. em. 7h. 42m.
28	10	39	♃'s first satt. will em.
28	19	12	Juno stationary
29			Ceres in conj. with the ☉
30	2	11	☽ in □ or first quarter
30	5	47	☌ in conj. with the ☽ diff. of dcc. 3. 48. S.
	14	23	☿ greatest Hel. Lat. S.

J. LEWTHWAITE, Rotherhithe.

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London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXLII.

Recent Patents.

To THOMAS RICHARDS, *of Liverpool, in the county of Lancaster, book-binder, for his invention of certain improvements in the art of book-binding, and also in the machinery or apparatus to be employed therein.*—[Sealed 15th April, 1842.]

THESE improvements consist, Firstly,—in the employment of mechanism, for the purpose of sewing, weaving, or binding a number of sheets of paper together, in a novel and peculiar manner, to form a book, instead of stitching them by hand, as commonly practised in book-binding; and Secondly,—in the novel combination and arrangement of machinery or apparatus, designed for the above purpose, and composed of a table, capable of sliding to and fro, in order to feed or supply each sheet of paper separately into the machine; also needle-bars or holders, to present needles with the requisite threads for stitching such sheets, as they are successively supplied. A series of holding fingers or pincers, suitably provided with motions, to enable them to advance and clasp the needles, draw them through the sheets of paper, and return them into their respective holders, after threading or stitching the sheet;

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and lastly, arms or levers for delivering each sheet regularly upon the top of the preceding sheets, in order to form a collection or book of such sheets, ready for boarding and finishing.

In Plate VII., are several views of the apparatus, which is shewn, for the sake of convenience, as broken off or detached from its standard framing, as that may be of any form, and elevated to a convenient height from the ground. Fig. 1, represents the machine in front elevation; fig. 2, is a transverse section, taken vertically in the line A, B, fig. 1; and fig. 3, is an elevation of the driving end of the machine.

The construction and operation of the apparatus, is as follows:—Two end-frames *a*, *a*, are bolted to the standards or uprights *b*, *b*, (of any convenient height from the ground,) and support, in bearings, the respective shafts *c*, *d*, and *e*;—*c*, is the driving-shaft, upon one end of which is a pulley *f*, driven by a band or strap, proceeding from a treadle-shaft below, in a similar way to a common foot-lathe, or in any convenient manner. Upon this shaft *c*, are keyed two excentrics or cranks *g*, *g*, for the purpose of raising and lowering the frame or carriage *h*, *h*, sliding in the vertical V-grooves *i*, *i*, formed in the end-framing *a*, *a*; to this frame or carriage *h*, is attached the longitudinal bar *k*, *k*, upon which are screwed the spring or clip-pieces *l*, *l*, *l*, forming together a series of fingers or holders, by means of the spring-pieces *l*, being pressed inwards against the back or bar *k*, which is effected by a cam *m*, (fig. 2,) upon the shaft *d*, turning the half-round or D-shaped rail or bar *n*, *n*, a portion of a revolution, by means of the connecting-levers *o*, *o*; this bar is supported in the carriage *h*, and kept in close contact with the spring-clips *l*, by the clamps or bearers *p*, *p*. Upon the cam-shaft *e*, there are three sets of cams; those marked *q*, and *r*, being for the purpose of moving the needle-bars or holders *s*, s^1, to and fro, alternately, as required, by working against the bars or tail-pieces *t*, t^1, attached respectively to the needle-bars, sliding in the horizontal V-grooves *u*, *u*, formed in the end-frame *a*, *a*; and those marked *v*, *v*, being for the purpose of raising and lowering the pressing-rail *w*, *w*, which is notched to allow the needles to pass, and presses the sheet upon the points of the needles, and afterwards conducts

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it below by means of the combination of levers x, x^1. A crank-pin y, (fig. 3,) fixed in the large spur-wheel z, turning on a stud in the end-frame a, works the table 1, 1, (upon which the sheet, to be stitched, is placed,) to and fro upon the rails 2, 2, by the assistance of the parallel motion or levers 3, 3, 3. It will be observed, that these several motions are all suitably geared with the driving pulley, by means of the spur-pinions 4, 4, 4, and the bevil-pinions 5, 5, with the diagonal shaft 6. Each separate sheet, to be stitched to form a book, must be previously prepared, by being folded singly, (and not a number together, one within another, as in common book-binding,) and having a thread gummed and placed longitudinally close in the fold; the ends of which longitudinal thread are to be brought through the back of the fold, within a short distance of the top and bottom, as represented by the line 7, 7, in the detached view, fig. 4.

The cross-stitching, to be performed by the machine, is as follows,—supposing the driving-band to be turning the pulley f, in the direction of the arrow; see fig. 3. As the driving-pulley f, revolves, the outer pinion 4, on the shaft c, being in gear with the spur-wheel z, causes the crank y, to draw in the table 1, with the folded sheet, (containing the longitudinal thread between its leaves,) until it meets with a stop, which allows the table to place the folded edge of the paper just sufficiently over the series of needles, in one of the bars or holders s, (the other bar or series of needles being behind out of the way,) so that in passing through the sheet, they shall confine the longitudinal thread between the folded edge of the sheet, and the vertical or cross thread put in by the needles. The bars v, v, as they revolve, will have depressed the upright levers x, x, placed in contact with them, and thus, by means of the levers x^1, x^1, have raised the guide or presser-rail w, w, just above the folded sheet, (shewn in fig. 2,) and will now cause that bar or rail w, w, to descend, and thereby press the sheet upon the points of the needles, and hold it fast upon the needle-bar s, so that the needles will protrude through the sheet of paper. At the same time the excentrics or cranks g, g, upon the shaft c, cause the frame or carriage h, h, to descend, until the open clips or

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fingers *t*, *t*, receive the needles. The cam *m*, by means of the levers *o*, *o*, partially turns the half-round shaft or bar *n*, *n*, and thus, pressing the spring-clips, closes them upon the needles, holding the series of needles between the clips and the back rail *k*. The continuous action of the excentrics *g*, *g*, will now raise the carriage *h*, *h*, with its clips holding fast the needles, and draw them and the threads upwards through the folded sheet; whilst the springs *s*, *s*, acting upon the bars *t*, *t*, pull the needle-bar *s*, *s*, slightly backwards, or out of the way of the presser-rail *w*. This rail now descends by the levers *x*, *x*, escaping the largest diameter of the cams *v*, *v*, and thus presses or takes down the threaded sheet and places it upon the pile, at 9, below. The table 9, upon which the threaded sheets are thus placed, one above another, is so contrived, that it can be readily adjusted to accommodate the length of the thread, as the sheets accumulate. The outer diameter of the cams *r*, *r*, now causes the needle-bar *s*, *s*, to return, when the excentrics *g*, *g*, will lower the carriage *h*, *h*, again, and replace or deposit the needles in the bar *s*, *s*; the lever *o*, escaping from the cam *m*, now turns the flat side of the shaft *n*, *n*, towards the spring-clips *l*, *l*, allowing them to open and release the needles, as the carriage *h*, descends. It will be seen, that there are two needle-bars or holders *s*, s^1, with a separate series of needles for each, and so contrived, that the needle-holders shall intersect each other; this arrangement of the needles, is in order that only each alternate sheet shall be stitched or threaded in the same place, and every other sheet shall be threaded or stitched at the intervening spaces; and consequently, the one series of vertical or machine-threads pass inside the longitudinal thread, in the folded sheet, and the other series of threads pass outside, or at the back of the same sheet, and *vice versa*, alternately, throughout.

This being the principal feature of novelty in the mode of sewing or weaving the sheets together, and being effected entirely by the alternate action of the needle-bars *s*, and s^1, will be readily understood by referring to the diagram, fig. 5, in which *a*, *a*, represents the folded sheets of paper, in the fold of which the black dot represents the longitudinal thread

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(as it were in cross section,) previously laid in; and the dotted line shews the course of one thread put in by the one set of needles s; and the drawn line, the course of the other thread, put in by the other set of needles s^1, thus forming a complete cloth or woven back, with each sheet separately secured. As the table 1, now advances, with another folded sheet to be stitched, the cams q, and lever t^1, push the other set of needle-holders s^1, forwards, when an exactly similar operation is performed upon this sheet also, excepting only that the series of threads have been stitched or placed through the folded sheet, at the intervening spaces left between the threads in the former sheet, in consequence of the changing of the double set of needle-bars, as previously described. After a similar operation of the machine has been performed upon a number of folded sheets, and they have accumulated below in a sufficient quantity to form the thickness of the book required, they are ready to be submitted to the subsequent operations of boarding and finishing, the threads being left long enough to form a substitute for the "end papers," commonly employed to secure the boards to the back of the book.

The patentee does not confine himself to the precise arrangement of the machinery, as exhibited in the drawings, as the various motions may be readily performed by other mechanical contrivances, without departing from the object of the invention.—[*Inrolled in the Petty Bag Office, October,* 1843.]

Specification drawn by Messrs. Newton and Son.

To William Robinson Shaw, *late of Leeds, in the County of York, but now of the Town and County of the Town of Derby, engineer, for certain improvements in feeding or supplying steam-boilers with water.*—[Sealed 31st January, 1843.]

These improvements consist in a novel apparatus for feeding or supplying steam-boilers with water, and adapting the same to a locomotive engine.

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In Plate VII., fig. 1, is a vertical section of the apparatus, shewing the positions and arrangements of its several parts, and its contiguity with the boiler of the engine. A, is a cylindrical vessel, intended to receive water, at its lower part, from a tank below, through the pipe and cock D; and B, is a pipe and cock, through which steam from the boiler is admitted into the upper part of the said cylindrical vessel A; C, is a bent tube, forming a communication between the bottom of the cylinder A, and the boiler, to which a valve E, is attached, opening into the boiler. The situation of the apparatus, as respects its connection with the boiler, should be such, that the lower end of the cylinder A, may be coincident with the level of the water in the boiler, or nearly so; fig. 2, is a horizontal view of the top of the apparatus; and fig. 3, a section, taken horizontally through the cylinder A, at the line *x*, *y*, of fig. 1. This cylinder A, is the feeder or vessel, through which water is to be conducted from the tank to the boiler, and it contains a circular float of wood G, nearly fitting the internal diameter of the vessel, in which it is intended to act like a piston. The ways through the pipes B, and D, being opened, by turning their cocks, steam will immediately rush into the cylinder and fill it, the float G, being then at the bottom of the vessel; but on closing the pipe B, the steam will immediately condense within the cylinder, and produce a partial vacuum therein. In consequence of this vacuum, the water will instantly rise from the tank below through the pipe and open cock D, and partially fill the cylinder A, carrying with it the float G, towards the top of the vessel. On now closing the way of the pipe D, by turning its cock, and opening the pipe B, steam from the boiler will again be allowed to blow into the cylindrical vessel; but it will not immediately condense, in consequence of the non-conducting properties of the wooden float or piston, G. It will be perceived, that the elastic pressure of the steam in the boiler is now acting equally upon the piston G, downward, through the pipe B, and against the valve E, of the pipe C; but the water in the vessel A, being above the level of that in the boiler, will, by its gravity, descend through the pipe C, and valve E, into the boiler. On the water having been thus discharged from the vessel A, the

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valve E, will close and prevent its return from the boiler. The cock of the pipe B, must now be again shut, and that of the pipe D, opened, when, by the pressure of water in the lower part of the cylinder, the steam occupying the cylinder, will again become condensed, and a partial vacuum take place as before; the water will then immediately rush up the pipe D, and fill the cylindrical vessel, carrying up the float or piston G, with it.

The same operation as that above described, will again discharge the volume of water from the cylindrical vessel into the boiler, and by continuing the opening and shutting of the cocks, in the order pointed out, the boiler will be constantly fed or supplied with water. The working of the cocks of the apparatus, or other kinds of valves, in their places, may, in a variety of ways, be accomplished by machinery, connected with moving parts of the locomotive engine. It will therefore only be necessary to advert to one method as an illustration:—A wheel may be connected to the plug of the cock D, with a worm working into it, driven from one of the axles of the engine, or by a pulley and band from the tender. A connecting-rod may be applied to couple the plugs of the two cocks or valves B, and D, together, (they being so arranged, that when one is opened, the other may be shut, and *vice versa*,) which may be done by a reciprocating or rotary contrivance, either of which would immediately suggest itself to any competent engineer, as its movements would be like those of the ordinary valves of the engine; and these may be actuated from the reciprocating parts of the engine, or otherwise; or they might be worked by hand.

The patentee does not confine himself to cocks, as described, for the apparatus may be worked by means of valves or slides; nor to the particular form and arrangement of the parts shewn in the drawing, by which the improvement is effected, as different forms and arrangements of parts of mechanism may be found capable of effecting the same object; but that which he claims, is the construction and adaptation (particularly to a locomotive steam-engine) of a steam vacuum pump, or vessel, of the kind described and shewn at A, A, in the drawing, with its steam and water-pipes, and cocks or valves B, D,

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and E, however they may be varied in form or arrangement; and the floating piston G, for the purpose of preventing the instantaneous condensation of the steam, before the water has become discharged from the cylinder.—[*Inrolled in the Rolls Chapel Office, July*, 1843.]

Specification drawn by Messrs. Newton and Son.

To FREDERICK GOOS, *of Manchester, in the County of Lancaster, Jacquard machine-maker, for certain improvements in the Jacquard machine, or apparatus, to be used or employed in looms for weaving.*—[Sealed 23rd May, 1842.]

THESE improvements in the Jacquard machine, or apparatus, consist in a novel construction or arrangement of the well-known piece of mechanism called the "Jacquard," whereby the figure or fancy work is now commonly wrought in looms. By this improved construction of the Jacquard machine, and also by the combination of certain novel parts now introduced, it is intended that the apparatus shall be more efficient and true in its operation, and less liable to injury, arising from any accidental derangement of its working parts.

The patentee has, in the first place, described and represented the Jacquard machine, as now commonly employed, in order that his improvements may be more apparent.

In Plate VIII., fig. 1, represents a transverse section, taken vertically through about the middle of an ordinary Jacquard machine or apparatus; fig. 2, is a transverse section of the improved construction and arrangement of Jacquard apparatus; and fig. 3, is a front view of the same, shewn as broken in the centre; the width of the machine depending upon the number of rows of needles required. The frame-work of the Jacquard is shewn at *a, a, a,* fig. 1, and is usually attached to the upper part of the loom-framing; *b,* is the top piece or cross-head, which carries the "griff" or grate *c, c, c,* for lifting the hooks or wires *d, d, d,* attached to the stringing *e, e, e*; *f, f,* represents the rack-teeth upon the griff; and *g, g,* the toothed segment, for the purpose of working the links *h, h,*

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attached to the card-cylinder *i, i,* in order to slide the same in and out as required. The needles are shewn at *k, k, k,* supported by the front board *l, l,* at one end, and by the wires *m, m,* in the back-rack, at the other end; behind these needles is the spring-box *n, n,* containing the springs *o, o, o,* which keep the needles up against the pattern-card *p, p.* The latches, for turning the cylinder to advance the cards, are shewn at *q, q**; (the latter being only used to reverse the cylinder when any false picks are made) *r, r,* is the hold-fast, which presses upon the "lantern" *s, s,* upon the end of the cylinder, and keeps it firm or square after every turn or pick; the hooked wires bed in the bottom plate or board *t, t,* and are kept even or square, in their action, by the guide-rails *u, u,* bearing upon their lower extremities.

The action of this common Jacquard machine is as follows:— Supposing the pattern-cards *p p,* perforated agreeably to the design intended to be wrought, extending over the cylinder *i,* and held thereon by the pegs *j,* passing between that and the front board *l, l,* those needles *k, k,* which pass through the perforations in the cards *p,* are not disturbed; but those opposite, to which blank spaces are presented by the cards, are thus pushed back by the card; and as the eye of the needle embraces the vertical hooks or wires *d, d,* it throws those wires out of the perpendicular, when the griff or grate *c, c,* is caused to ascend, by any suitable motion, communicated from the working parts of the loom, to the cross-head *b,* and thus lift those needles that are left in the perpendicular position, escaping those which have been thrown out of it by the card, and, consequently, pull up the strings *e, e,* connected to the warp-threads, and work the pattern in the cloth, as is well understood by the practical weaver.

By this description of the Jacquard machine, now in common use, the improved construction and arrangement will be immediately understood, on referring to figs. 2, and 3, where the whole machine, as now improved, is represented. Similar letters will be found upon corresponding parts of the apparatus, as in that just described. The features of novelty, by which the whole of the operations are stated to be performed in a more efficient manner, and the several parts secured

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from any accidental derangement which so frequently occurs in common Jacquard machines, consist, in the first place, in introducing a press-board A, indented, and removing the cylinder *i*, from its usual situation; by this contrivance, the cards are presented to the front board *l*, *l*, with more certainty, and any accidental breakage prevented, should the cylinder not be turned entirely round as the card advances; the cylinder is now made plain, or not indented, and employed merely for the purpose of advancing the cards, the press-board holding the cards to act upon the needles. Upon the front board *l*, as well as on the cylinder, pegs *z*, are placed, in order to ensure the more certain presentation of the cards to the needles; the position of the holdfast *r*, is also reversed upon the lantern *s*, and rods B, B, and springs C, C, are employed to act upon the lantern from below, as shewn; the bottom of the holdfast is bevilled, which further secures the correct position of the card-cylinder; it will also be seen, in fig. 3, that an independent lantern S, S, is employed outside the framing, with a flange to guide the latches *q*, *q**; these latches being in one piece instead of two. Another improvement, in this part of the apparatus, is made by having the cylinder guide-frame D, open at the end, in order that the cylinder and press-board, with their carriage, may be readily removed, to put the cards over. The bottom rail D*, of this guide-frame, is made adjustable by bolts and slots, that the guide may be always kept true; and the carriage and slide H, H, of the cylinder, is kept firm by the cross-rod Q, Q. By this improved arrangement of the cylinder-carriage and slide, the patentee is enabled to place the slide H, inside the guide-rails D, D, instead of outside, as heretofore. Additional holdfasts E, E, are placed at the top of the cards, to press them on the cylinder, which are not weighted by springs, but rise and fall by their own gravity, their guide-rods sliding in holes in the cross-rail F. G, G, are two rods, with springs attached, having flat heads or discs counter-sunk in the front board, for the purpose of pushing the card off the needles *k*, *k*; and the pegs *z*, after they have acted on the needles or springs, may be placed in the front board, which shall have a similar effect when the press-board recedes. The bottom

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guides I, I, are constructed of plate-iron instead of using the wooden rails *u, u*; and slots are pierced therein for the hooks *d, d*. The plate I, is connected by the frame K, K, to the griff, and rises and falls with it, sliding on the guide-rods L, L;—M, M, are a series of wires under this plate, to prevent the hooks being displaced.

A most important feature in this invention is making the tail ends of the hooked wires *d, d, d*, so long that they shall extend upwards above the top row of needles *k, k, k*; these tail ends, then bearing against a series of horizontal wires N, N, N, will act as springs upon the needles, and entirely supersede the use of the spring-box *n, n*, and the spiral springs *o, o*. The wires N, N, may be placed horizontally, as drawn, or they may be placed in a diagonal position, when they will possess the further advantage of supporting the needles.

A further improvement in the Jacquard machine consists in substituting the disc O, O, having circular studs or teeth P, P, upon its side, to work into the rack *f*, upon the griff, instead of the toothed segment *g, g*, as such arrangement will facilitate the gearing; and an improved mode of fastening the segment-plate to the links *h*, is also employed, as shewn in the detached view, fig. 4.

The patentee claims the improved arrangement and construction of apparatus exhibited at figs. 2, and 3, of the drawings, and described above; and most particularly as relates to the press-board; the holdfasts; the bottom plate and wires; the tail ends of the hooks, extending above the level of the top needles; the springs for pushing the cards off the needles or front board; the placing of the cylinder-slide, or carriage, inside their guide-rails instead of outside; the guide-rods L, and cross-rods Q; the circular teeth for working in the rack upon the griff; and the improved stud, or fastening, for the links, shewn in fig. 4.—[*Inrolled in the Petty Bag Office, November*, 1842.]

Specification drawn by Messrs. Newton and Son.

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To FREDERICK ALBERT WINSOR, *of Lincoln's Inn Fields, in the County of Middlesex, Barrister at Law, for an invention of a new apparatus for the production of light,—being a communication.*—[Sealed 26th January, 1843.]

THIS invention consists in an apparatus or burner, for the production of light; and it is applicable to a variety of lamps or chandeliers, containing reservoirs for oil or other combustible liquors or fatty matters, or supplied with inflammable gas, in the manner hereinafter set forth.

The burner is shewn in Plate VIII.; it requires no wick, but consists essentially of a central tube, communicating with the reservoir containing the supply of oil or other combustible material, the supply of which is regulated by means of a cock.

a, fig. 1, is the central tube, open at its upper extremity a^1, where it is rounded off, and below which there is a small shoulder or projection *b*. At a short distance below its orifice or orifices, proceeding downwards from this projection, the tube is surrounded by a thin metallic box *c*, presenting an inclined surface, over which the combustible material, issuing from the orifice of the central tube, descends. An external thin metallic box or cover *d*, surrounds the inner box, as well as the upper part of the central tube. This external box is longer than the internal box, so as to rise some distance above the orifice of the central tube, and to leave room for a filter, or series of metal rings, hereafter described. The external box fits air-tight upon the lower extremity of the inner box, by means of a ledge, cone, screw, or other convenient fitting. A narrow space, say from one-eighth to one-twentieth of an inch, is left between the external and internal box. Around the lower extremity, above the air-tight joint of the external box, a number of small holes *e*, are pierced, similar to those in an ordinary gas-burner, for the exit of the inflammable material which is there ignited. This portion of the external cap may be conveniently projected or enlarged, and the holes may be drilled at an elevation of from 15° to 20° above the horizontal level. The portion of tube above the projection *b*, is intended to

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receive a strip of linen, or hempen, or similar fabric, of about three-quarters of an inch in width, and from about two to four inches in length, according to the size of the burner; this strip is to be wound round the central tube above the shoulder, so as to form a filter for the oil, or other material, issuing from the orifice or orifices in the central tube, previous to its descending the narrow space formed between the inner and outer boxes. Linen, although it becomes charred by the action of the heat to which it is exposed, has been found to answer the purpose of preventing an unsteadiness or flickering of the flame, which would otherwise occur; it will, however, require renewing from time to time. The same result may be obtained by placing three or four metallic rings, at a small distance apart, around the central tube, (occupying the place of the linen strip,) and nearly filling the upper cavity of the outer cover or box, as represented at fig. 2.

In order to adjust the level of the burner and the glass chimney, by which it is surrounded, screws may be employed, or a tube, sliding in a stuffing-box. The proper height of the combustible liquid, in a fountain or other reservoir, will be found to coincide with the bottom of the thin metallic cases, so as to be just below the row of holes pierced in the burner. The thin metallic boxes must be constructed of a metal which is capable of being raised to a red heat without injury, and not easily corroded by chemical action; silver, and alloys of silver and platinum, will be found to possess these qualities, and are consequently preferred.

The lamp is lighted and set in action by first raising the metallic boxes to a red heat, by means of a little spirit of wine, contained in a spoon, constructed so as to surround the central tube. As soon as the burner has obtained its proper temperature, the combustible material is gradually supplied, and, issuing from the orifice or orifices of the central tube, descends through the filter, or over the rings already described, down between the narrow space formed by the outer and inner boxes, until it issues at the orifices surrounding the external box, where it is ignited; the combustible material having, during its transit, been subjected to a high degree of heat, whereby it has been rendered an inflammable vapour

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or gas before reaching the point of ignition. Once lighted, the flame itself maintains the requisite temperature to continue the action.

The patentee claims "conveying the combustible material to the upper extremity of the internal box, over which it descends, and the arrangement by which it is subjected to the action of heat in a thin and extended stratum; also the use of a linen filter, or rings of metal;" but he does not claim the conversion of oil into gas, by the action of its own heat, nor the mode of starting or lighting the lamp, by the use of spirits of wine, or the mere use of a chamber, in which the combustible material is subjected to heat, unless arranged in the manner hereinbefore described.

The same construction of burner may be applied to the distribution of light obtained from gas, or gaseous products, when the illuminating power of the gas is to be increased by the addition of naphtha, or other substances rich in carbon, and where the subjection of the gas to a high degree of temperature, previous to ignition, would be important; he therefore claims the application of the burner for that purpose.—[*Inrolled in the Inrolment Office, July,* 1843.]

To James Hancock, *of Gloucester-place, Walworth, civil engineer, for a method of forming a fabric or fabrics, applicable to various uses, by combining caoutchouc, or certain compounds thereof, with wood, whalebone, or other fibrous materials, vegetable or animal, manufactured or prepared for that purpose, or with metallic substances, manufactured or prepared.*—[Sealed 8th February, 1840.]

The fabrics, produced by this invention, are suitable for sheathing ships, covering the roofs of houses, and other buildings, and for various other purposes; they are made by weaving or platting wire, strips of wood, whalebone, cane, or other suitable substances, so as to form a base, on each side of which a sheet of cloth, caoutchouc, or other material, is secured, by means of a solution of caoutchouc.

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When the fabric is to be used for sheathing ships, its base is formed of thin strips of whalebone, one fourth of an inch wide, from one-fortieth to one-thirtieth of an inch thick, and of the same length as the sheathing is required to be, that is, about thirty-four inches; and these strips are platted, crossed, or woven together, in such a manner as to leave open spaces of from one-fourth to one-half of an inch between the strips. Instead of the whalebone, thin strips of metal, or wire, either flat or round, may be used; or the strips of whalebone, and metal, and the wire, may be platted together alternately. The base, thus formed, is placed between two sheets of felted cloth, of the required size, and the whole is saturated with the compound solution of caoutchouc, hereinafter described.

The method of saturating the fabric with the solution of caoutchouc, is as follows:—The solution is contained in a metal trough or pan, heated by a steam-bath, and at one end of it is a roller, on which the fabric is wound; from this roller the fabric passes between a pair of rollers, immersed in the solution, and then between another pair, mounted in bearings above the trough, for the purpose of removing the superfluous portion of the solution; it is thence conducted over another roller, at the other end of the trough, and between a third pair of rollers, which exert a greater pressure upon it than the rollers before-mentioned; after this, it is cut to the required size, and the edges are bevilled by means of a knife or other instrument.

In order to make the solution, above referred to, a quantity of caoutchouc is dissolved in coal-tar oil, or oil of turpentine, and passed through an iron strainer; equal quantities of pitch, and Archangel or Stockholm tar, are then mixed together, and, after being heated by a steam-bath, the dissolved caoutchouc is added to them, in the proportion of eleven parts of the caoutchouc to one of the pitch and tar mixture.

For covering roofs, the base of the fabric is made by weaving or platting together shavings of wood, from one-thirtieth to one-twelfth of an inch in thickness, which is then placed between two pieces of felted cloth, as before described; or the base may be made by platting together strips of whalebone,

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or cane. The fabric is then subjected to pressure, by passing it between a pair of heated cylinders or rollers, and, when dry, it is cut to the required size.

A fabric, which may be used as a substitute for leather, is produced by platting or weaving strips of cane, whalebone, or wood, separately, or together, alternately, and placing the base, thus formed, between two pieces of scale-board, the surfaces of which have been covered with the caoutchouc solution. The fabric is then passed between a pair of rollers, and, when dry, is ready for use.

By weaving together strips of wood and coarse thread, a fabric for hat bodies is formed; the strips of wood constituting the weft, and the coarse thread the warp, or *vice versa*.

In some cases, the patentee covers the bases of whalebone, wood, or other materials, with silk, muslin, paper, woven cloth, or sheet caoutchouc; first coating the surfaces with the caoutchouc solution, and then subjecting the fabric to pressure.

Another fabric is produced by using wire, woven in the usual manner, as an intermediate substance, and covering it, on both sides, with cloth, or other material, prepared as hereinbefore mentioned. These fabrics are applicable, amongst other purposes, for forming military caps, scabbards, and cartouch-boxes, panels and roofs for coaches, and tilts for carts, vans, and other vehicles.

The patentee claims the method of forming a fabric or fabrics, by combining caoutchouc, or certain compounds thereof, with wood, whalebone, or other fibrous material, vegetable or animal, manufactured or prepared for that purpose, or with metallic substances, manufactured or prepared, as herein described.—[*Inrolled in the Inrolment Office, August*, 1840.]

To WILLIAM PALMER, *of Sutton-street, Clerkenwell, in the County of Middlesex, manufacturer, for improvements in the manufacture of candles.*—[Sealed 26th January, 1843.]

THE first part of this invention consists in making wicks for candles, by forming one or more strands into a linked or

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looped plat, as represented in Plate VII., at fig. 1; the strand or strands being composed of several yarns, either loose, or formed into a cord, or otherwise combined.

The machinery used in making the linked plat is of the kind called "warp-lace machinery;" it should be of a coarse gage, and have only one row of guides, that is, one guide to each pair of needles on the needle-bar. Each guide is caused to lap over two needles, in order to form one loop thereon, which being carried under the beards of the needles, the work that was previously on their stems is forced off, and thus each pair of needles will make a linked plat or cord.

The second improvement consists in forming wicks of five or more strands, platted together in such a manner as to produce a wick nearer approaching to a cylindrical form than when three strands only are used, or when more than three strands are used, and each strand is alternately passed diagonally under and over one strand only, in the manner of braiding. Fig. 2, shews a portion of a wick formed by platting five strands together according to this improvement.

The third part of the invention relates to those candles which have two platted wicks, and consists in strengthening the wicks, by binding a thread or yarn round them, in a spiral direction, as seen in the section, fig. 3; or combining them together in any other manner; the face or bending surface of one wick comes against the back of the other, and they will thus bend out of the flame in the same direction.

The patentee claims, Firstly,—the mode of manufacturing candles, by making them with linked or platted wicks, each composed of a series of loops. Secondly,—the mode of manufacturing candles, by making them with platted wicks, each composed of five or more strands, as above described. Thirdly,—the mode of manufacturing dip or mould candles, by applying two similar platted wicks in the same candle, and in such a manner, that they will both turn in the same direction out of the flame.—[*Inrolled in the Inrolment Office, July*, 1843.]

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To JOSEPH PARKES, *of Birmingham, in the County of Warwick, button manufacturer, for improvements in the manufacture of covered buttons.*—[Sealed 30th December, 1840.]

THIS invention relates to improvements in the manufacture of covered buttons, made by dies and pressure, by the application of horn as a covering material. The process resorted to by the patentee, for carrying out his invention, is very similar to that pursued in manufacturing Florentine buttons; such modifications being applied as are rendered necessary for adapting such process to the peculiar nature of the material employed for covering the face of each button. *a*, fig. 1, shews a plan of a disc of iron plate, with four projecting points, which is formed by suitable dies in a fly-press, as is well understood; the points are then turned down, and the disc *a*, is sunk into the shape shewn at fig. 2, and two such sunk discs are applied to the internal core of the button-board of each button. *b*, fig. 3, shews a plan and edge view of a circular disc of button-board, suitable for forming the internal core of a button.

The dies being placed in suitable presses, as is well understood in using similar dies in manufacturing Florentine or other covered buttons, one of the sunk discs *a*, is placed in the under die, with the points upwards, having a disc of button-board placed on the points, as shewn at fig. 4; the upper die or punch is then caused to descend and press the button-board *b*, into the shape shewn at fig. 5; which, when thus formed, is to have a disc *a*, applied on the other side, as shewn at fig. 6. The disc *a*, to be next fixed to the button-board, is placed in a suitable die, the disc, which has already been fixed, being upwards; the die or punch is now to be pressed down, which will produce the button-board, with the discs *a*, *a*, on either side, into the shape shewn at figs. 7; and it will be seen, that one of the discs will, by the shape of the die, be sunk concave, whilst the other disc *a*, on the other side, will be formed convex, or according to the figure of the face of the intended button.

The core of button-board, figs. 7, is now ready for being

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inserted into the fabric which is to become the flexible shank of the button, and which flexible shank is formed by sinking a portion of fabric in suitable dies, as is well understood when making similar shanks for Florentine or other covered buttons; and the shank being so sunk, the button-board or core, figs. 7, is to be placed thereon, with the concave surface towards the protruding shank; and the edges of the fabric are then to be pressed over the core, (as is well understood,) which will produce the partly-formed button, fig. 8, which is a side view, and consists of the shank containing the core, which is next inserted into the metal shell *c*, fig. 9; and these parts being placed in a suitable die, are pressed together, and the partly-manufactured button, fig. 10, will be produced, consisting of the shank, containing the core, covered on the front surface with the metal shell *c*, which, by the die, has its edges bent down on the fabric of the flexible shank. The button, thus far formed, is now in a condition to be covered with a thin plate of horn, which is performed in the following manner:—*d*, fig. 11, shews a disc of horn, cut out by suitable dies, the circumference being scolloped, in order that in folding over the mould, fig. 10, the horn may not be puckered. *e*, *e*, figs. 12, shew a collet, for affixing the covering of horn to the button, the collet being similar to that used in what is called "Sanders' plan of making Florentine and other covered buttons."

The method of covering the mould of the button with horn, is described as follows:—Fig. 13, represents, in section, a lower covering-die, and also a proper punch for pressing the parts into the lower die; these dies being in a suitable press, as is well understood. The lower die is to be kept heated to such an extent that the workman can just bear his hand to rest, for a very short time, on the upper surface of the die; the heating is preferred to be accomplished by means of a flame of gas below the die; and it will be seen, that there are holes *f*, *f*, in the die, through which the heat of the flame may pass; and *g*, is an opening, to allow of atmospheric air flowing under the lower die. The disc of horn *d*, is placed in the lower die G. The shape or mould, fig. 10, is then placed on the horn, and the punch or die H, is caused to descend, and press the parts into the die G; the punch H, is

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then raised, in order to allow of the introduction of the parts shewn at figs. 14, and 15, which consist of the tube I, and the punch or die J. The lower edge of the tube I, is made bell-mouthed, so as to cause the scolloped edges to be pressed on to the back of the button; and the die or punch J, is to cause the collet to be forced through the horn into the button; and, in using these parts, the collet is placed in the tube I, which, with its punch, is inserted into the die G, as shewn at fig. 16; which figure represents the die G, and punch H, in the condition just described, after having forced the parts into the die G; and this figure also shews the tube I, with a collet *d*, and the punch or die J, placed in the tube I; and all things are in a condition to receive the pressure of the punch H. In order to prevent the pressure coming on the punch or die J, before the horn has been folded down by the tube I, the hollow block K, is placed over the die or punch J; consequently, when the punch H, is caused to descend, it will force down the tube I, and cause it to gather the edges of the horn, and press them on to the back of the mould of the button, when the punch H, will be again raised, and the block K, removed, which will leave all things in the position shewn at fig. 17; and then again, the bringing down of the punch H, will cause the die or punch J, to descend, and force the collet into the button, the die J, being retained in the tube I, by means of the pin *z*, passing through a slit formed therein, which allows of the die J, rising and falling in the tube I, but prevents its coming out of that tube. The button, thus far formed, is now in a condition to be completed in the finishing dies, fig. 18; the lower dies being kept heated in a similar manner to the die G. The dies being fixed in a suitable press, the button to be finished is inserted into the die L, (which may be ornamented or plain,) with the shank upwards, and the punch or die M, is caused to descend, and press the button into shape.

When the front of the button is to be plain, the disc of horn should be polished before being used for covering; but when used to cover a button, and finished by an engraved or ornamented die, the polishing is not necessary. The button being thus made, is to be finished by placing it in a lathe to be

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"edged," as is commonly practised in finishing horn buttons.

The patentee does not claim the means of making the mould or shape shewn at fig. 10, nor the dies employed, when separately considered, very similar dies and means having been before used in the manufacture of other covered buttons; nor does he confine himself thereto, so long as the peculiar character and essence of the invention be retained; viz., that of manufacturing covered buttons, made by dies and pressure, by the application of thin sheet horn, as the covering material. He claims the mode, herein described, of manufacturing covered buttons by the application of horn as a covering material, as above described.—[*Inrolled in the Inrolment Office, June*, 1841.]

To THOMAS HARRIS, *of Hale's Owen, near Birmingham, horn button manufacturer, for his invention of improvements in the manufacture of what are called horn buttons, and in dies, to be used in the manufacture of such description of buttons.*—[Sealed 22nd April, 1841.]

THIS invention relates, Firstly,—to a mode of applying flexible shanks in the manufacture of horn buttons. Secondly,—to a mode of ornamenting horn buttons, by inlaying the front surface thereof. Thirdly,—to a mode of ornamenting what are called horn buttons, by gilding or silvering their surfaces. Fourthly,—to a mode of constructing dies, by applying separate boundary circles to each engraved surface of a die, by which the process of engraving, as well as the forming of accurate dies, will be facilitated. Fifthly,—to a mode of constructing dies, used in the manufacture of horn buttons, whereby the horn or hoof employed will not be permitted to be expressed beyond the circumference of the button.

In Plate IX., fig. 1, represents, in section, a pair of dies A, and B, used in producing the improved horn buttons, according to the first improvement; the upper die A, is made to produce the back surface of the buttons, and the recess or groove for receiving the flexible shank. Figs. 2, shew, in section and back view, the form of a button, produced by the dies.

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Buttons, thus formed, are now ready to receive flexible shanks; and if the buttons are to have plain smooth front surfaces, then, in fixing the flexible shanks, the same kind of under die B, may be used; but if the front surface of the button is to be embossed or ornamented, then, in place of that die, a similar one, having engraved or suitably ornamented surfaces, is to be used. When fixing the shanks to buttons, the lower or face die, containing the previously formed buttons, is to be heated till a drop of water will nearly boil upon it.

The shank is applied as follows:—A metal shell or collet *a*, (see figs. 3,) is placed over the flexible shank *b*, and a plate of metal *c*, is laid under the shank; these are placed in the groove or recess of the button which had been previously heated in the lower die; the upper die A, fig. 4, is then to be placed on the lower die B, and the two submitted to pressure, until they become cool, when the shank will be firmly attached, as shewn at figs. 5, and the button may be finished in the usual way.

The second part of the invention, which relates to a mode of ornamenting horn buttons, by inlaying the front surface thereof, is performed in a manner similar to what has been above described, for fixing flexible shanks, and consists in first forming the front face or surface of a button, in suitable dies, for producing a recess; and then, by a second pressure in dies, to fix the ornamental surface; and, when desired, the surrounding front surface of the button may be embossed. Fig. 6, is a longitudinal section of a pair of dies, for forming a recess in the face of a button. Fig. 7, shews, in front view and section, a horn button, produced by these dies. Fig. 8, shews a metal ornament, to be inlaid or fixed in the front surface of the button; but it should be stated, that the ornamenting surface, to be fixed in the front surface of the button, may be of pearl, or other material; and the size and device varied according to taste. Fig. 9, shews, in section, a pair of dies, for giving the second pressure for affixing the ornamental surface; and, if desired, the remaining front surface of the button may be ornamented, by having the lower die engraved, or otherwise suitably ornamented. Fig. 10, shews, in front

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view and section, a button, made according to this part of the invention.

The third part of the invention relates to a mode of ornamenting horn buttons, by gilding or silvering their surfaces. This is effected by applying a suitable cementing or adhesive material, with a soft brush, to the button, in order that gold or silver leaf may be attached to its surface. The cementing or adhesive material, preferred to be used, is drying varnish, rendered sufficiently liquid by essence of turpentine; and when the varnish is nearly dry, gold or silver leaf is applied thereto, and pressed in the same manner as practised when gilding and silvering other surfaces; by thus treating horn buttons, a very novel manufacture of that description of buttons may be produced.

The fourth part of this invention relates to the construction of dies, used in the manufacture of horn buttons. Fig. 11, is a section of a die, constructed according to this part of the invention; and fig. 12, is a section, shewing the die without the bounding circles, which confine the pattern. *f*, is the die, engraved at the parts *g*, *g*; around each of which engraved surfaces are circular grooves or recesses, to receive the bounding circles *h*, *h*, which fit accurately. By the after insertion of these circles, the workman is not confined to move his graver within the bounding line, as that line is not present when engraving the plate; and the graver may pass beyond, and the grooves and the bounding circles may readily be made, with great accuracy, to each of the engraved surfaces.

The fifth part of the invention also relates to a mode of constructing dies, for the manufacture of horn buttons, and consists in forming the dies, so that the bounding circle shall be of a sufficient depth for the counter-die to slide within it, and fit accurately, in order that the circumference of each button shall be smoothly and accurately formed. Fig. 13, represents, in section, two dies, and one counter-die, made according to this part of the invention; fig. 14, shews one of the dies, in plan and section; and fig. 15, a plan and section of a counter-die, suitable for flexible shank buttons. *h*, *h*, are the dies, having the engraved surfaces *i*, *i*, on separate circular discs of metal, such as have heretofore been used; *j*, is

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a counter-die; and *k*, a tube, within which the counter-die is held; the object of this tube being to guide the projecting edges *l*, *l*, of the dies, as shewn, and thus keep the dies and counter-die correct to each other. Fig. 16, is a section of two dies *h*, and a counter-die *j*; but in this case, the tube *k*, is dispensed with, the dies being deeper sunk, and thus guiding the counter-die correctly. By the use of these dies, the edges of horn buttons will be more accurately formed, and consequently require less finishing. This description of dies may be made according to the mode described in the fourth part of the invention; that is, by forming the boundary circle separately, as will be understood by referring to fig. 17, which is a side section of a die complete, with its boundary circle formed in a similar manner to that described above. Figs. 18, represent, in plan and section, a variation in the means of affixing a separate bounding circle to each engraved surface; and it is suitable for working without the tube. In using these dies, they are to be heated but slightly, whether for buttons with metal shanks, or to receive flexible shanks, and are to be pressed, as heretofore.

The patentee claims, Firstly,—the mode of manufacturing horn buttons, with flexible shanks, by first forming buttons by pressure and heat, and then by a second pressure, in dies, to affix flexible shanks thereto, as above described. Secondly,—the mode of ornamenting horn buttons, by causing suitable surfaces to be affixed in the front surfaces, by pressing the buttons with the ornaments, in dies, as above described. Thirdly,—the mode of ornamenting horn buttons, by gilding and silvering their surfaces, as described. Fourthly,—the mode of constructing dies, used in the manufacture of horn buttons, by applying separate bounding circles to each engraved surface for a button; and Fifthly,—the mode of manufacturing horn buttons, in dies, wherein the horn or hoof is prevented from being expressed at the circumference of the buttons, as described.—[*Inrolled in the Inrolment Office, October*, 1841.]

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To EDWARD SMALLWOOD, *of North Lodge, North End, Hampstead, in the County of Middlesex, Gent., for improvements in covering roads, ways, and other surfaces.*—[Sealed 26th January, 1843.]

THE first part of these improvements consists in forming blocks or planes for paving, and slabs or tiles for covering foot-ways, walls, and other surfaces, with one-half of their sides convex, and the other half, or opposite sides, concave; so that, when a number of them are placed together, they will mutually support and be supported by each other.

In Plate VII., fig. 1, is a transverse section of part of a road-way, formed with these blocks; figs. 2, and 3, are perspective views of two kinds of the improved blocks; (the upper surface of one being square, and the other hexagonal,) and fig. 4, is a plan and edge view of one of the tiles. But the upper surfaces of the blocks and tiles may be made of other forms besides those represented in the drawing; and the convexity and concavity of their sides may be curvilinear, instead of rectilinear.

A mode of manufacturing blocks for paving, out of refuse pieces of wood, constitutes the second part of this invention. The block is formed in an iron frame or mould, (which can be taken to pieces) in the following manner:—Over the bottom of the mould a thin surface of sand, cement, lime, or other earthy matter, is spread, and its internal sides are washed with whiting; the pieces of wood are then placed in the mould, with the grain in a vertical direction; having been first dipped in a composition, prepared by throwing into melted pitch as much lime and other earthy matter, mixed with saw-dust, as it will absorb, and still be sufficiently fluid. The lighter pieces of wood occupy the centre of the mould; and after the surface has been covered with road-grit, sand, cement, or dust, the block is consolidated by pressure; the mould is then removed, and, when cold, the block is fit for use.

The object of the third improvement, is to render the surfaces of wooden blocks, and the grooves thereof, less susceptible of decay. This is accomplished by burning, charring,

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or carbonizing the grooves and surfaces of the blocks, by means of red-hot searing irons, and likewise by the application of sulphuric acid thereto.

The claims made by the patentee are, First,—the peculiar forms of blocks, planes, or tiles, hereinbefore described, in regard to their construction at their respective opposite sides or ends of corresponding convexities and concavities. Secondly,—the use and application of various particles of wood, placed together vertically, and consolidated by pitch, combined with earthy or other suitable matter, as hereinbefore mentioned, in the formation of blocks or coverings for paving and covering roads and ways, and other like purposes. Thirdly,—the exclusive right of charring or carbonizing the grooves and surfaces of blocks and planes of wood, for the paving or covering of roads and ways, and of burning in and deepening the grooves thereof.—[*Inrolled in the Inrolment Office, July*, 1843.]

To Edward Joseph François Duclos de Boussois, *of Clyne Wood Metallurgical Works, near Swansea, in the County of Glamorgan, engineer, for improvements in the manufacture of copper.*—[Sealed 11th November, 1841.]

These improvements consist, Firstly,—in calcining all sulphurous ores of copper, and artificial products of the same nature, in large kilns; whereby a large proportion of the coal and labour, required in the ordinary treatment, are economized, and the sulphurous acid gas and sulphuric acid, formed in the operation, (which are irretrievably lost in the ordinary method,) are made applicable to the manufacture of sulphur or sulphuric acid. Secondly,—(when the ores have been sufficiently calcined,) in treating them for the reduction of the metallic oxides that they may contain, in a blast furnace, similar to those used in the manufacture of iron, with the addition of chambers of condensation and feeding apparatus; such additions being calculated to ensure the collecting of any volatile produce that the ores, so treated, may contain. The earthy matters, associated with the ores, are fluxed, by a

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proper addition of lime, or other substances, as the chemical composition of the ores may require. Thirdly,—in submitting the mixture of metallic copper and cast-iron, obtained in the preceding operation, to fusion and liquidation in a common iron-founder's cupola, modified to ensure the liquidation of the two metals. Fourthly,—in submitting the black copper, (from which the cast-iron has been separated by difference of gravity,) to the refining process, in the refinery-furnace, attached to the furnace of liquidation.

The ores of copper are ground to the size of one-fourth or one-third of an inch, and mixed with quick-lime, in the proportion of about 2½ cwts. of quick-lime to each ton of copper ore. The quick-lime is slacked thin, and mixed with the ore in the same manner as common mortar; it is then spread upon heated floors, to the thickness of two inches, or two inches and a half, and cut into parallelograms, of the same size as common bricks. The floors are kept hot for twenty-four hours, and then the rough bricks are removed to the kiln, where the calcination is to be effected; this is shewn in Plate VII., fig. 1, being a longitudinal section; fig. 2, a transverse section; and fig. 3, a plan of the same. The doors, through which the bricks have been piled, being closed and luted, a fire is kindled on the grate of the kiln-furnace, and kept up until the mass becomes of a dark red heat; the ash-pit door, to which air-slides are fixed, is then closed hermetically, as well as the fire-door, and the admission of the fresh air is thus controlled, for the purpose of keeping the mass of ore burning at the same temperature; which is also better effected by the regulation of the draft of the escaping products of the combustion, by means of dampers, placed on the eduction-flues.

It is found, in practice, that when the first combustion is over, it is advantageous to light another fire, at a rather increased temperature, and thus more completely obtain the expulsion of the sulphur contained in the ore, by the repetition of the above-described treatment.

The ores of copper, in lumps not exceeding two inches square, may be calcined in prismatic kilns, with double grates, with the same arrangement as the kiln above described, for

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the regulation of the draft; and when sufficiently calcined, may be taken at once to the blast-furnace; an elevation of which, with its condensing-chambers in section, is represented at fig. 4, and a sectional plan, taken on the line *a*, *b*, is shewn at fig. 5. The ore, thus calcined, is charged with a sufficient quantity of coal, coke, or charcoal, in such proportion as the calorific power of the fuel, and refractibility of the ores, will best allow; and a proper quantity of lime, or other flux, is also to be added. The charge is put into the furnace in such a manner as to avoid the escape of any volatile product, other than through the chamber of condensation. The working of the furnace is the same as that followed in the working of iron ore, taking care to work with a highly-heated blast, and with closed breast, endeavouring to obtain a slag highly charged with lime; by which means the reduction of the metallic oxides is more completely insured, and their carburation, as far as iron is concerned, more certainly obtained.

The mixture of cast-iron and copper is tapped out as cast-iron, in the most advantageous shape for the re-fusion; and the pigs of mixed metals, thus obtained, are melted in a cupola, connected with a refinery-furnace, both of which are represented in section at fig. 6. The melted metals are, by a disposition which keeps them at a high state of temperature, allowed to separate by difference of gravity, (the copper precipitating under the cast-iron,) and are tapped at different levels. The cast-iron contains one-half or one-quarter per cent. of copper; and the copper, which contains from twenty to twenty-five per cent. of iron, is allowed to run out of the cupola into the refinery-furnace, where it is kept at a high temperature, to effect the separation of the copper from the cast-iron; and this separation is facilitated by the mode usually followed in the refining of black copper, in the furnace where it has been tapped out of the cupola.

The patentee claims the mode of calcining the ores, and fusing them in a blast-furnace, as herein described; and also the mode of separating, by liquidation, the metals obtained in the treatment of the blast-furnace, as above described.—[*Inrolled in the Inrolment Office, May*, 1842.]

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To JAMES TEMPLETON, *of Paisly, manufacturer, and* WILLIAM QUIGLAY, *of the same place, weaver, for machinery for a new and improved mode of manufacturing silk, cotton, woollen, and linen fabrics.**—[Sealed 25th July, 1839.]

THIS invention consists in weaving fabrics of silk, cotton, woollen, linen, or other fibrous materials, which are to be cut into strips, and used as weft, somewhat in the manner of chenille weft, (but with this difference, that the two edges of the strip shall incline more towards each other,) and then weaving such strips on a ground, so that all the fur or cut edges of the strips may be brought to one side of the fabric, while the other side is plain;—and which invention is applicable to the manufacture of carpets, rugs, shawls, mats, covers of stools, chairs, or tables, tapestry, or any cloth or fabric requiring to be raised, so as to have the appearance of velvet, fur, or plush.

A texture or fabric of silk, cotton, woollen, linen, or of a mixture of two or more of these materials, is first woven; having the warp threads spaced or set in the reed at certain equal distances from each other, in the following manner:—One, two, or more splits of the reed are filled with the warp-threads, and then a space of the reed, (equal to double the length of the fur required,) is left empty; then one, two, or more splits of the reed are again filled with warp-threads, and another space is left empty, as above described; and this is repeated until the required number of strips is completed. The warp being thus spaced and arranged in the loom, the weft is thrown in, so as to form either a plain or colored surface, and the warp acts on the weft in the manner of gauze or cross-weaving: that is, the warp-threads, instead of being left parallel, as in common weaving, are crossed over each other by each tread on the treadles; and the weft, when thrown in, intersects the warp, and its edges acquire a tendency

* By a memorandum of alteration, lodged with the Clerk of the Patents, and dated December 13th, 1839, the title of this patent stands thus:—"an improved mode of manufacturing silk, cotton, woollen, and linen fabrics."

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to come together, in consequence of the cross-weaving which the warp has received. On this web being cut into strips, through the vacant spaces already described, the weft, or lateral fibres of both sides of each strip, are all thrown up on one side, and brought close together. The process is somewhat similar to that followed in making chain weft, but with this difference, that the fur or pile, (that is, the lateral fibres of both sides of each strip,) when cut, are all brought upon one side, and into close contact, instead of projecting from all sides of the warp or body thread, as in the case of chenille weft.

At figs. 1, and 2, in Plate VIII., are represented two modes of cross-weaving, exhibiting the crossings of the warp, and intersections of the weft. In fig. 1, are two splits-full of Turkey gauze, of three threads in the split; those two splits-full being separated by one empty split, or otherwise. Three shoots of weft or fur are uncut, and six shoots cut in the centre. The figure exhibits the effect which the crossing of the warp-threads have upon the fur, in causing both sides of the weft, when cut, to incline towards each other, leaving the warp-threads to serve as a back-bone or back-band to the lateral threads or fibres. Fig. 2, exhibits two crossing threads, turning round a cord or dead thread, which is accomplished with "bead lams." This figure also exhibits, in some degree, the appearance of the fur when woven, and the effect the crossings produce after it has been cut.

The pattern intended to be produced on cloth, manufactured partly with the prepared weft, is copied on design paper, formed with as many horizontal lines as there are to be shoots of the prepared weft in the cloth; after these lines of the design-paper are cut asunder into strips, and numbered, the weaver enters them through the reed of the loom, (beginning with number one,) and commences to weave the colors of weft, in the exact order in which the colors are painted on these pieces of paper.

The ground-warp of the cloth is prepared with an extra warp, which may be termed the catcher-warp; a shed is formed of both warps, to receive the ground-weft, but a shed of the catcher-warp only for the prepared weft; there being

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fewer threads of the catcher-warp than the ground-warp, less resistance is offered to bringing the fur of the weft to the surface. In some cases, a portion of the ground-warp is used for fixing the fur-weft upon the surface. The weaver having thrown in a shoot of the fur-weft, sets it in its proper place with his hand, or otherwise, and then, with a brush, comb, or other instrument, raises all the fibres of the fur from the catcher-warp, or that part of the ground-warp which is to fix it on the fabric, and drives it firmly up with the slay. He now throws in as many ground-shoots as are deemed necessary to form the ground of the cloth, and then repeats the operation of weaving in the fur, and so on, alternately, until the required length of cloth is produced.

The patentees claim "the mode, hereinbefore described, of producing or preparing strips of silk, cotton, woollen, or linen, or of a mixture of any two or more of these materials, in such manner that the weft or lateral fibres of both cut edges of each strip are all brought up on one side, and into close contact with each other; and the re-weaving of such strips, with the whole fur or pile uppermost, into the surfaces of carpets, rugs, shawls, or other similar articles, at the same time that a ground-work or platform is woven for the same."—[*Inrolled in the Rolls Chapel Office, December*, 1839.]

To WILLIAM WATSON, *of Temple-street, Dublin, Gent., for an improvement in the construction of ships; and which improvement is also applicable to all kinds of sea-going vessels; and also certain improvements in the construction of boats, and other vessels, intended to be used on canals and inland navigation.*—[Sealed 12th June, 1839.]

THIS invention is divided into two parts; the first of which relates to the construction of ships and sea-going vessels, and consists in employing metal ribs in place of the ordinary timbers or ribs. The metal ribs are T-shaped, and the outer planks of the vessel are fastened thereto by rivets, bolts, or screws; a layer of felt or cloth being placed between the planks and ribs.

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The second part of the invention relates to the vessels employed on canals, and for inland navigation. It consists in forming the vessels in two or more water-tight parts or compartments, which may be easily detached from each other, when required. The patentee says, that many ways of separating the vessel into two or more water-tight compartments, and connecting the said parts together, may be devised; but he prefers to divide the vessel, at the middle, into two parts; or else to separate it into three portions, by cutting off about one-fourth of the length from both ends. These portions are connected together by hinges; so that when the length of the boat is required to be reduced, in order to pass it through a lock, it may either be doubled, or the stem and stern may be brought round alongside of the hull. By this means the vessel will be enabled to pass through shorter locks than usual; but the breadth of the lock must be increased.

The patentee claims, Firstly,—employing metal ribs in place of the ordinary timbers in ship-building. Secondly,—dividing canal boats into two or more compartments, which, being jointed together by hinges, will fold back, and thereby reduce the length, when required.—[*Inrolled in the Inrolment Office, December*, 1839.]

To HENRY CHAPMAN, *of Arundel-street, Strand, in the County of Middlesex, engineer, for a fabric for maps, charts, prints, drawings, and other purposes.*—[Sealed 26th January, 1843.]

THE subject of this invention is a fabric called "paper-cloth," prepared in such a manner that one or both of its surfaces have the character, quality, and finish of paper, suitable for writing, drawing, and printing upon, and all those purposes for which mounted paper has been hitherto employed.

The preparation of the fabric is conducted as follows:—A suitable quantity of canvass, gauze, muslin, calico, linen, or other similar fabric or cloth, is wound upon a roller, called the cloth-roller, which is introduced between the upright

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felt, or third press-felt, and the drying-cylinders of a Fourdrinier paper machine; and between the cloth-roller and the endless felt a trough is introduced, containing a solution of gum, glue, size, starch, or other adhesive material, with a roller partly immersed in it. Pulp being now allowed to flow upon the endless wire web of the machine, paper is made in the ordinary manner; and when the endless sheet of paper has been led through the machine, and the manufacture is proceeding in a proper manner, the end of the cloth is brought over the upper part of the roller in the trough, and moved onwards in the direction the paper is proceeding. The motion of the cloth causes the roller to revolve, and the adhesive material, carried up on its surface, is imparted to the cloth, which is then laid upon the paper, as it passes over the roller immediately preceding the third or last press-roller. By passing between these rollers, the cloth and paper are firmly united, and, being dried by the steam drying-cylinders, form one compound fabric, which is then reeled, or else cut into sheets of the required size, by the ordinary cutting machinery.

If required, a paper surface may be applied to the other side of the cloth, by a repetition of the above operation; and when the cloth or fabric has been prepared with a strong adhesive dressing, (similar to book-muslin,) the adhesive material, before mentioned, may be dispensed with. The upright felt must be washed at the conclusion of each day's operations, to remove the adhesive material, which would injure the felt, if allowed to dry in it.

The adhesive material, which the patentee has found to answer best, is prepared as follows:—A solution is made of four parts, by weight, of soda, in fifteen parts of water; and in this, nine parts of yellow resin are dissolved, by means of heat; it is then boiled for an hour, (a minute quantity of linseed oil being introduced, occasionally, to prevent frothing,) and one part of glue is added to the mixture; after which it is diluted with one and a half times its weight of water, and strained through flannel. Thirty parts of this compound are mixed with one part of flour-paste, and six of paper-pulp, and used in a hot state.—[*Inrolled in the Inrolment Office, July*, 1843.]

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To GEORGE JARMAN, *of Leeds, in the County of York, flax and cotton spinner;* ROBERT COOK, *of Hathersage, in the County of Derby, heckle and needle manufacturer; and* JOSHUA WORDSWORTH, *of Leeds aforesaid, machine-maker, for certain improvements in machinery for spinning flax, hemp, and tow.*—[Sealed 14th February, 1842.]

THESE improvements consist in certain novel arrangements or constructions of the drawing apparatus, for flax-spinning machinery, by means of which the drawing out or extension of the rovings for yarns is performed, by two or more distinct sets of holding and drawing-rollers, and not by a progressive series of drawing-rollers, as in cotton-spinning machinery.

This object may be effected by various modifications of mechanism, but that found to answer the purpose best is shewn in Plate IX., where fig. 1, represents an elevation of part of the front of a drawing and spinning-machine, or throstle-frame, constructed on the improved plan; and fig. 2, a sectional elevation of the same, taken transversely through the machine. A longitudinal bar of iron *a*, called the beam, extends along the frame behind the rollers; which beam is firmly affixed to the end-standards of the frame-work, and is otherwise supported in the usual way; *b*, *b*, *b*, are a series of brackets, affixed to the beam *a*, which constitute the stands that support the lower rollers. Sliding-pieces *c*, are attached to the several stands, forming bearings for carrying the shaft of the first under-rollers *d*, and are each capable of adjustment, by means of a screw below, for the purpose of regulating the position of the first rollers, and thereby determining the length of reach or draft between them and the second under-rollers *e*, the shaft of which turns in stationary bearings in the brackets or stands *b*. The shaft of the third or front series of under-rollers is shewn at *f*, turning also in stationary bearings in the stands *b*. The ordinary mode of driving the rollers, is by communicating the first moving power to the shaft of the front under-roller *f*, the reverse end of which shaft has a pinion, taking into a wheel *z*, turning loosely

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upon a stud *y*, mounted upon the end-standard. Affixed to this wheel *z*, is a pinion *x*, which takes into a wheel *w*, on the end of the shaft of the under-roller *e*, and hence drives that roller with a diminished speed. The other end of the shaft *e*, has a pinion, taking into a similar stud-wheel, which communicates, through a pinion on the shaft of the under-roller, *d*, a further diminished speed to that first or back under-roller. The upper or pressing-rollers *g*, and *h*, are held in contact with the peripheries of the under-rollers *d*, and *e*, by a saddle-bar *t*; and the other pressing-rollers *i*, and *k*, are held in contact with the peripheries of the under-rollers *e*, and *f*, by a saddle-bar *r*, which is pressed upon by a clamp *q*. These saddle-bars and clamp are held down, by screwed nuts, upon the lever-bolts *n*, *n*, which are connected, by joints, to a swivel-piece *p*. To the middle of this swivel-piece *p*, a link *o*, is attached by a joint, the reverse end of which link is, in like manner, connected to the shorter arm of a bent lever *m*. This lever *m*, hangs upon a fulcrum-pin, in a bracket *l*, affixed to the beam *a*, and, by a moveable weight being suspended from the longer arm of the lever *m*, the link *o*, and piece *p*, will be drawn back, and the nuts *u*, *u*, when screwed up on the lever-bolts *n*, *n*, will be made to press the saddle-bars and clamp *t*, *r*, and *q*, with considerable force, against the axles of the upper or pressing-rollers *g*, *h*, *i*, and *k*; thereby causing those pressing-rollers to nip and hold the fibres of the rovings, between them and the under-rollers, with any required force, according to the position of the weight. In order to regulate the pressure of the saddle-bar *t*, upon the rollers, that is, to cause it to bear more or less upon the axle of either of the rollers *g*, or *h*, a washer *s*, is placed upon the upper lever-bolt *n*, beneath the nut *u*, which washer has a tooth on its lower edge, that may be inserted into either of the notches at the back of the saddle-bar *t*, and thereby throw the pressure more or less upon either of the pressing-rollers *g*, or *h*, as may be required. With a similar object, the clamp *q*, is placed upon the lower lever-bolt *n*, bearing against the saddle-bar *r*; and this clamp is forced up by screwing the nut *u*, on the lever-bolt; the greater or less pressure upon either of the

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rollers *i*, or *k*, being regulated by shifting the bearing of the clamp into either of the several notches in the back of the saddle-bar *r*.

The mode of operating, with this improved drawing apparatus, upon the rovings of flax, hemp, or tow, for the purpose of elongating or drawing out their fibres, is as follows:—The rovings being placed upon spools or bobbins, in a creel, behind the rollers, as usual, they are severally drawn off and conducted through a trough of water; and being led through notches, in a guide-plate, shewn at *j*, in the section, fig. 2, each roving is thence passed between the first pair of rollers *d*, *g*. The roving being led onward, next proceeds between the second pair of rollers *e*, *h*, which rollers, moving with a greater speed than the preceding pair, necessarily draw out the fibres of the material, extending the length, and reducing the substance of the roving. The difference of speed between these two pairs of rollers, causes *d*, *g*, to hold, or partially retain, the roving, whilst the rollers *e*, *h*, draw or elongate it; and the space between them is called the reach, the length of which, as before said, may be varied, by shifting the situation of the sliding-piece *c*. After this first operation of drawing has been effected, the roving passes onward between the rollers *e*, *i*,—the roller *i*, revolving at the same speed as the rollers *e*, *h*; consequently there will be no drawing operation or elongation of the fibres of the roving between the rollers *h*, and *i*; but the rollers *e*, *i*, will become partially retaining-rollers for the next pair of drawing-rollers *f*, *k*. The rotary speed of the rollers *f*, *k*, as beforesaid, is greater than that of the rollers *e*, *i*; therefore a further extension, or drawing out of the fibres of the roving, will take place in the reach between the rollers *e*, *i*, and *f*, *k*, which may be considered to have completed the elongation or drawing out of the fibres of the roving; and it may then proceed in its thin or refined state through a guide to the spindle and flyer below, by which, in the ordinary way, it may be twisted or spun into yarn. It has been found useful to place upon the upper part of the spindle a disc *v*, for the purpose of keeping off the yarn from the upper edge of the bobbin.

The patentees claim the introduction of a distinct retaining-

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roller or rollers, after the first reach of the drawing apparatus, instead of continuing, uninterruptedly, the process of progressive drawing, as by the old system of drawing-rollers.—[*Inrolled in the Petty Bag Office, August,* 1842.]

Specification drawn by Messrs. Newton and Son.

To WILLIAM HENRY STUCKEY, Gent., *of Guildford-street, for certain improvements in filtering water and other fluids.*—[Sealed 3rd December, 1842.]

THESE improvements in filtering water and other fluids are described as consisting in the employment of compressed sponge, as a filtering material, and in a method of cleansing the said compressed sponge.

An elevation of the filtering apparatus is represented in Plate IX., at fig. 1; and a vertical section of the case, containing the filtering material, at fig. 2. The sponge is held in a compressed state in the case *a*, between the two plates *b*, *c*; these plates have a number of openings formed in them, as shewn in fig. 3, (which is a plan view of the plate *b*,) and are connected together by the bolt *d*, and nut *e*. The case *a*, is suspended in a frame *f*, by bands *g*, *g*, which are wound uppon the barrels *h*, *h*, when it is required to be raised; and the case is guided, in its ascent and descent, by a pin *i*, projecting from each side of it, and working between the upright rails f^1, f^1, of the frame. By turning the handles *j*, *j*, motion is communicated to the barrels *h*, *h*, through the pinions *k*, *k*, and wheels *l*, *l*; and the barrels are held in any required position by a ratchet-wheel and click, at the end of each.

When in operation, the filtering apparatus is placed in the water or other fluid to be filtered, and the case *a*, is lowered into it to the depth shewn in fig. 2; the water will consequently ascend through the compressed sponge, until it arrives at the same level as the water outside of the case, and, by so doing, will be deprived of its impurities; it is then drawn off by a syphon, or any other suitable contrivance. If the water be of a very foul or putrescent description, a layer of charcoal may be placed between the pieces of sponge.

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When the sponge requires cleansing, the case *a*, is raised out of the water, by means of the bands *g*, *g*, and the clear water, which has collected above the sponge, rushes down through it, and carries off the greater portion of the impurities. Then, if the bottom of the sponge be not sufficiently cleansed, it is allowed to expand, in a slight degree, by raising the nut *e*; after which the case is turned upside down, by means of the bands *g*, *g*, and lowered into the water, to the depth shewn in fig. 2; when the water, rushing up from below, through the sponge, will carry to the top most of the remaining impurities. The case *a*, being now turned over into its original position, the foul water, which has collected at the top, is poured into the cistern or reservoir; the supply of water is then shut off, and the cistern is emptied of its contents, or the impurities are allowed to settle.

The claims made by the patentee are, Firstly,—the employment of compressed sponge as the filtering material; and Secondly,—the means provided, as aforesaid, for cleansing the sponge, from time to time, without removing it from the machine.—[*Inrolled in the Inrolment Office, June*, 1843.]

To THOMAS THIRLWALL, *of Low Felling, Durham, engine-builder, for certain improvements in lubricating the piston-rods of steam-engines and other machinery.*—[Sealed 8th September, 1843.]

THIS invention consists in applying to the cover of steam-engine or other cylinders, a box for holding oil, or other material, to be used for lubricating the piston-rods of those cylinders. The figure in Plate IX., shews the cylinder, with its cover, and also the lubricating-box, attached thereto, in section; this box may be either cast with the cover or bolted thereto. *a*, *a*, is the cylinder; *b*, the piston-rod; *c*, the cover; and *d*, the box, which is supplied with oil through the funnel *e*.—*f*, is a hollow bush or collar, surrounding the piston-rod, and having openings for the oil to flow freely thereto; this collar is kept stationary, by the packing *g*, *g*;

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h, is the cover of the lubricating-box, and *i*, is a cock for drawing off the oil when the box is to be cleaned out.

The patentee states, that he does not claim the placing a box or case, containing oil, around the piston-rods of steam-engines, for the purpose of lubrication; but he claims "the mode of lubricating the piston-rods of steam-engines, and of other machinery, by the application of a box or case, containing oil or other lubricating matter, around the piston-rod, combined with a hollow bush or collar, with openings therein, to allow the lubricating matter to pass to the piston-rod."—[*Inrolled in the Inrolment Office, March*, 1843.]

To WILLIAM ROCKE, *of Prince's End, in the county of Stafford, mechanic and engineer, for improvements in the manufacture of mineral colors.*—[Sealed 3rd September, 1842.]

THESE improvements consist in manufacturing colors from the minerals known by the names of the new mine iron-stone, the poor robin, the rock mine, and the bindes; and also from those known as the black clunch, the black sliper, and the black cannock.

Colors are prepared from the new mine iron-stone, poor robin, rock mine, and the bindes, in the following manner:—For a stone color, grind any one of these materials into fine powder, and pass it through a sieve; it will then be ready for mixing with oil, according to the usual method of preparing colors. Or, put the pulverized mineral into a vessel of water, and, after a short time has elapsed, draw off the water into a another vessel, and allow it to settle; the mineral will be deposited at the bottom of the vessel, and, when dry, is ready for use. To obtain the darker colors, such as black, brown, umber, and red, a suitable quantity of any one of these minerals is calcined in an oven or furnace, with a slow regular heat, until it assumes the color required; it is then taken out of the furnace, and reduced to powder, as before mentioned. The colors produced will vary according to the intensity of

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the heat applied: thus, a slight degree of heat will produce black; a greater degree brown; and by a further increase of heat, umber, ochre, and red, will be obtained.

A good black color may be obtained by reducing either the black clunch, black sliper, or black cannock, into powder, and passing it through a sieve. A white color, (which may be used as a body for other colors, such as yellow, green, and blue,) is prepared by calcining any one of these minerals into a white ash, and passing it through a sieve, when cold.

The patentee does not confine himself to the method of manufacturing colors herein described; but he claims the manufacturing of colors from the minerals known by the names of the new mine iron-stone, poor robin, rock mine, and bindes; and also from the minerals called the black clunch, black sliper, and black cannock, as above described.—[*Inrolled in the Inrolment Office, March,* 1843.]

To Richard Barber, *of Leicester, reel manufacturer, for improvements in the manufacture of boots, shoes, and clogs.* —[Sealed 8th December, 1842.]

This invention consists in forming the soles for boots, shoes, and clogs, of the horns or hoofs of animals, pressed into the required shape by means of heated dies.

The sole is preferred to be made in two or more parts, so that the tread or fore part may bend in the act of walking; and the under part of the sole should have small cavities formed in it, which will become filled with grit, gravel, &c., and prevent slipping. It is attached to the in-sole by brads, or by sewing; the holes being made by the dies above mentioned.

The patentee says, he is aware that heels for boots and shoes have been made by pressing horn or hoof between dies; but that complete soles have never been made in this manner. He therefore claims the mode of manufacturing boots, shoes, or clogs, by constructing and applying soles of horn or hoof, as described.—[*Inrolled in the Inrolment Office, June,* 1843.]

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Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 137, Vol. XXIII.)

March 14th, 1843.

The PRESIDENT in the Chair.

No. 547. "Description of a method of laying down Railway Curves on the ground."

By William John Macquorn Rankine, Assoc. Inst. C. E.

THE method described in the paper depends on the well-known principle, that the angle subtended at any point of the circumference of a circle, by a given arc of that circle, is equal to half of the angle subtended at the centre by the same arc.

The points which must be ascertained beforehand are the same as in every other method of laying down curves, namely,—the radius; the number of degrees, minutes, and seconds in the entire arc of the curve; and the length of the two equal tangents; either of which three quantities can be calculated from the other two. The commencement of the curve (A), its termination (B), and the intersection of the two tangents (D), are to be marked on the ground as usual.

It is supposed that the centre line of the railway is marked by stakes driven at equal distances—say of 100 feet. Let (E) represent the last stake in the portion of the line immediately preceding the curve, the distance (A F) from the commencement of the curve to the first stake in it will be the difference between 100 feet and (E A). The angle at the circumference subtended by the arc (A F) must be calculated, and a delicate theodolite having been planted at (A), this angle is to be laid off from the tangent. The telescope will then point in the proper direction for the first stake in the curve, and its proper distance from (A) being set off by means of the chain, its position will be determined at once.

The angles at the circumference subtended by (A F) + 100 feet, (A F) + 200 feet, (A F) + 300 feet, (A F) + 400 feet, &c., being also calculated, and laid off in succession, will respectively give the proper direction for the ensuing stakes (G), (H), (I), &c. which are at the same time to be placed successively at uniform distances of 100 feet by means of the chain. It is scarcely ne-

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cessary to observe, that the difference between an arc of 100 feet and its chord, on any curve which usually occurs on railways, is too small to cause any perceptible error in practice, even in a very long distance; but should curves occur of unusually short radii, it is easy to calculate the proper chord, and set it off from each stake to the next, instead of 100 feet, the length of the arc.

When the inequalities of the ground prevent a distant view from any three stations, to lay down the entire curve from them any stake which has already been placed in a commanding position, will answer as a station for the theodolite.

By this method the operation of laying down a circular curve of any radius, is made exactly analogous to that of laying down a straight line, with the assistance of the telescopic sights of a theodolite.

It is stated that by this method the curve is laid down with accuracy at the first operation; that any accidental error in the position of a single stake, affects that stake only; and it has been found in practice that the progressively increasing errors of the old method are entirely avoided.

Mr. Gravatt observed, that a well-made theodolite was a convenient instrument for setting out curves for railways, and that it had been used by him and by his assistants for this purpose for several years. The common theodolite was not, however, in practice universally applicable without some further contrivances for accommodating it to this peculiar service.

He stated, that the circular arc (used, he believed, almost universally on railways) was not the true curve for a line of rails; as might be proved by considering that a straight line of road required both rails to be at the same level, when viewed in the cross section, whilst on a curved road the outside rail required to be raised, in order to resist the tendency of the engine and carriages to fly off the rails in going round the curve.

Where a straight line was joined on to a circular arc, the beforementioned condition would require an instantaneous and vertical rise of one of the rails, which was a condition that could not be fulfilled.

In curves of contrary flexure, if composed of circular arcs, the difficulty was increased; for the outer rail, which ought to be the highest, suddenly became the inner and the lowest, so that an instantaneous elevation of one rail, and a corresponding depression of the other, was required; if the curves were of the same radius,

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the alteration would be of double the extent to that required when passing on to the same arc from a straight line.

Therefore, as the outside rail must be, in all cases, the highest, the circular arc, which required the manifestly false condition of an instantaneous elevation, could not be the true curve.

He had several years since demonstrated that the true curve was one, which commenced with an infinite radius, decreased in a regular manner, in advancing on the curve, when the radius might be constant for some time, and then increased again to infinity, before it joined either a straight line or another curve of contrary flexure.

He had fixed upon the elastic curve, which complied with all the conditions required, but other curves were also applicable.

His late assistant, Mr. W. Froude, had found that arcs of a cubic parabola, whilst they complied with the necessary conditions, were extremely convenient in practice; the equation and its fluxions, or differential co-efficients, being very simple and easy of application.

Mr. Froude had also applied other properties of that curve, so that with the assistance of a few calculated tables, the process of setting out a true curve was rendered as easy in practice as setting out a circular arc. With any curve there was considerable practical difficulty in finding the direction of the tangents, the radii of curvature, and the position of the curves upon the ground.

Mr. Gravatt used what he termed a skeleton plan, of several stakes driven into the ground nearly in the course of the intended line, expressing their position by columns of figures with reference to two co-ordinates; thus obtaining a numerical accuracy far greater than that of any drawn plan.

By using a table of sines and co-sines, a few hours' calculation would save many days' labour in the field, besides ensuring an accuracy not otherwise to be obtained.

No. 553. "Description of Lieutenant D. Rankine's Spring Contractor."

By Wm. John Macquorn Rankine, Assoc. Inst. C. E.

This paper describes a contrivance for suiting the action of the springs of railway carriages to variable loads, so as to give the proper ease of motion to a carriage when heavily laden, and at the same time to be sufficiently flexible for light loads. Its effect is to make the strength and stiffness of the spring increase in proportion to the load placed upon it. Each extremity of the

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spring, instead of supporting a shackle or roller, as in the usual construction, carries a small convex plate of cast-iron. The form and position of this plate are so adjusted, that when the carriage is unloaded, it bears on the extreme end of the spring, thus allowing it to exert the greatest amount of flexibility; but as the plate is convex, the more the load increases, and the further the ends of the spring descend, the nearer does the point of bearing of the plate upon the spring, approach to the centre or fulcrum, so that the convex plate or contractor tends to diminish the virtual length of the spring in proportion to the load; the result of which is to increase the strength of the spring, in the inverse ratio of its virtual length, and its stiffness in the inverse ratio of the cube of the same quantity.

The author then gives, in a tabular form, the details and the results of some experiments made on springs of this description, which are similar to those now in use on the Edinburgh and Dalkeith Railway. The springs were 4 feet long, each consisting of ten plates, each $\frac{1}{4}$ inch thick, and $2\frac{3}{4}$ inches broad. The contractors were cast with a radius of $12\frac{1}{4}$ inches, and so constructed as not to act until the load on each spring exceeded 10 cwt., and with a load of 30 cwt. they should have contracted the distance between the bearing points to 3 feet 4 inches instead of 4 feet; by this means the strength of the spring was increased in the ratio of 6 to 5, and its stiffness in the ratio of 216 to 125.

The advantages stated to be derived from the use of these springs on the Edinburgh and Dalkeith Railway, and other lines, are:—

That they afford the same ease of motion to a single passenger as to 40 or 50 in one carriage; they save wear both of carriages and railway track; they produce the strength and stiffness requisite for the maximum load, with less weight of metal; they are not more expensive than rollers; and they are not offensive in appearance,—indeed they would not be observed unless they were pointed out.

No. 597. "Results of the application of Horse Power to raising Water from the working shafts at Saltwood Tunnel, on the South-Eastern Railway, in 1842."—By Frederick William Simms, M. Inst. C. E.

THIS Tunnel is driven in the middle bed of the lower greensand, between which and the surface of the ground is interposed only the upper bed of the same stratum; but in sinking the

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eleven shafts for the work, it was found that at the level of the top of the tunnel the ground assumed the character of a quick-sand, saturated with water, in such quantity that it could not be reduced by manual labour. Under these circumstances horse gins were erected for drawing the water by barrels, containing one hundred gallons each, weighing when full about 1310 lbs.

The engineer's intention was to drive simultaneously from these shafts, in the direction of the tunnel, an adit or heading to carry off the water; but the earth, which was sand mixed with fine particles of blue clay, was so filled with water as to become a mass of semifluid mud, great exertions were therefore necessary to overcome the water, without erecting pumps. At first this was accomplished by making each horse work for 12 hours, and then for 8 hours per day, allowing one hour for food and rest; as the water increased it became necessary to work night and day, and the time of each horse's working was reduced generally to 6 hours, and sometimes to 3 hours. As all the horses were hired at the rate of seven shillings per day, the author, who had the direction of the works, ordered a daily register to be kept of the actual work done by each horse, for the double purpose of ascertaining whether they all performed their duty, and also hoping to collect a body of facts relative to horse power, which might be useful hereafter. This detailed register, which was kept by Mr. P. N. Brockedon, is appended to the communication.

The author gives us a proposition, "That the proper estimate of horse power, would be that which measures the weight that a horse would draw up out of a well; the animal acting by a horizontal line of traction turned into the vertical direction by a simple pulley, whose friction should be reduced as much as possible." He states that the manner in which the work was performed, necessarily approached very nearly to these conditions; and after giving the principal dimensions of the horse gins, he analyzes each set of experiments, and by taking the mean of those against which no objections could be urged, he arrives at the following results:—

The Power of a Horse working for 8 hours	= 23,412 lbs.	raised 1 foot high in one minute.
Ditto	ditto	6 „	= 24,360 „	ditto
Ditto	ditto	4½ „	= 27,056 „	ditto
Ditto	ditto	3 „	= 32,943 „	ditto

Of these results he thinks the experiments for 6 hours and for 3 hours alone, should be adopted as practical guides, all the others being in some degree objectionable.

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As a means of comparison, the following table of estimates of horse power is given :—

Name.	Pounds raised 1 foot high in a minute.	Hours of Work.	Authority.
Boulton and Watt..	33,000	8	Robinson's Mech. Phil., vol. ii., p. 145.
Tredgold	27,500	8	Tredgold on Railroads, p. 69.
Desagulier	44,000	8	Dr. Gregory's Mathematics for Practical Men, p. 183.
Ditto	27,500	Not stated.	
Sauveur	34,020	8	
Moore, for Society of Arts	21,120	Not stated.	
Smeaton	22,000	Not stated.	

These are much higher results than the average of his experiments, and would more nearly accord with the extremes obtained by him; but under such excessive fatigue the horses were speedily exhausted, and died rapidly. Nearly one hundred horses were employed, they were of good quality, their average height was 15 hands ¼ inch, and their weight about 10½ cwts., and they cost from 20*l.* to 40*l.* each. They had as much corn as they could eat, and were well attended to.

The total quantity of work done by the horses, and its cost, was as under :—

	Tons.
Registered quantity of water drawn 104 feet, the average height, 28,220,800 gallons	= 128,505
Ditto, ditto, earth, 3,500 yds. 1 ton 6 cwt. per yd.	= 4,550
Total weight drawn to the surface . .	133,055

	£.	s.	d.
Total cost of horse labour, including a boy to drive each horse	1,585	15	3

Or, 2·85 pence per ton, the average height of 104 ft.

As soon as the adit was driven, all the water was carried off by it, and the works are stated to be perfectly dry.

Mr. Palmer said, it should be understood, that in stating 33,000 lbs. raised one foot high in a minute, as the measure of the power of a horse, Boulton and Watt had not intended to fix that as the average work which horses were capable of performing: they had taken the highest results of duty performed by powerful

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horses, in order to convince the purchasers of their steam-engines that they received all that had been contracted for.

He had made some experiments on the amount of work performed by horses tracking boats on canals: on the upper end of the mast of the boat a pulley was hung; over this the towing rope was passed, with the means of suspending to its extremity given weights, so as exactly to balance the power exerted by the horse.

The results arrived at by these means were so various, that he could not deduce any average conclusions; as the power exerted varied between 30 lbs. and 120 lbs., the power diminishing as the speed was increased: he thought that 2½ miles was too high an average estimate, and that it should not exceed 2 miles per hour.

Mr. Field remarked that in all estimates of horse power, the speed was considered to be at an average of 2½ miles per hour, and all experiments were reduced to that standard.

Mr. Hawkins said, that some years since, he had made numerous inquiries respecting the work done by horses in drawing upon common turnpike roads, and found, that four good horses could draw an ordinary stage coach, with its complement of passengers, 8 miles a-day, at the rate of 10 miles an hour; that if they ran stages of 10 miles in the hour, the horses must rest one day in each week: that good horses, so worked, would last only five years, each horse drawing about half a ton; he had been informed by waggoners, that good horses would walk, at the rate of 2½ miles per hour, for twelve hours out of the twenty-four, making 30 miles a-day; and that they would continue to do such work, day by day, each horse drawing one ton, for many years, provided they had not been worked hard when young.

Mr. Gravatt observed, that although there might exist some hesitation in receiving these results of work actually performed, as a general measure of a horse's power, yet as engineers frequently required to know what could be performed by horses, when employed for short periods, in works of haste or difficulty, he thought that the experiments were useful, and would form good data for reference.—He was sorry to observe that in too many cases, an idea was prevalent, that it was cheaper to work a small stock of horses to death, than to keep a large number and to work them fairly; the results which he had been enabled to arrive at, were perhaps not a fair value of a horse's work, continued for any length of time, at the best rate of economy, for both the contractor and the employer.

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The President believed that however, in cases of emergency, which he allowed did occur in engineering works, the forced system of labour mentioned by Mr. Gravatt might be tolerated, he was convinced that it was not the most economical, but on the contrary, humanity and economy would be found to go hand in hand.

It would be desirable to know the average speed at which the different rates of work had been performed; this was essential in order to found any calculation upon the results given. Coach proprietors calculated that at a speed of 10 miles per hour, a horse was required for every mile going and returning, so that one horse was kept for every mile of road. Now supposing a four-horse coach, with an average load, to weigh 2 tons, the load for each horse was 10 cwt.; whereas in the case of a horse drawing a cart, the gross load frequently amounted to 2 tons, but the speed was reduced to 2½ miles per hour, at which pace he conceived that 16 miles per day might be considered a fair day's work; this therefore was double the distance with four times the load, or eight times the coach-work, but with a heavier horse.

The law that the quantity of work done, was as the square root of the velocity, or, as the cube root of the velocity, in equal times, was confined to work upon canals, or bodies moving through water.

Mr. Rennie had tried some experiments on the force of traction of the boats on the Grand Junction Canal. The towing rope was attached to a dynamometer which had previously been tested by weights.

The horse, although urged at first starting, was afterwards allowed to fall into his natural speed, which was 2½ miles per hour on the average of 20 miles. The maximum speed was 4 miles, and the minimum 2 miles per hour. The dynamometer indicated an average of 108 lbs., which was capable of overcoming the resistance of the loaded barge of 25 tons, being in the ratio of 1·500. The weight of the horse was about 11 cwt.

He had also tried many experiments upon a fast boat, lent to him in 1833, by the late Colonel Page. These experiments were principally made in order to ascertain the comparative resistance of vessels moving through water at different velocities, and the Grand Junction Canal afforded a convenient opportunity of undertaking them.

The boat was 70 feet in length, 4 feet in breadth, and drew 9 inches of water.

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The traction indicated, by the dynamometer, the following resistance:—

Miles per hour.		lbs.
At 2½	the resistance was	20
3	„	27
3½	„	30
4	„	50
4½	„	60
5	„	70 to 75

One horse was employed in these experiments.

Miles per hour.		lbs.
At 6	the resistance was	97 to 214
7	„	250
8	„	336
9·69	„	411
10	„	375
11¼	„	392
	Average.....	336

Two horses were employed in these experiments.

Stakes were fixed near the margin of the canal, so as to ascertain the rise and fall of the wave caused by the boat in passing; and it was observed that when the boat passed with a velocity of from 4 to 6 miles per hour, the rise of the wave was 5 inches, and the fall 5 inches, making a wave of 10 inches in depth; and when the velocity was 11¼ miles, the rise was reduced to 2½ inches, and the fall to 2½ inches.

Great difference existed in the power of horses, their weights, and structure; and the large dray horses used by Messrs. Barclay, Perkins, and Co., did a full average duty, as assumed by Boulton and Watt; but considering the average power of strong and of weak animals, he had adopted 22,000 lbs. raised 1 foot high, as the standard; much however depended on the nature of the work performed.

Mr. Charles Wood remarked, that although, on an emergency, it might be necessary to work horses to the extent which had been mentioned, it had always been found more economical to feed them well, and not unduly to force the speed, the weight drawn, or the hours of labour. By the recorded experiments on ploughing, which were tried at Lord Ducie's and by Mr. Pusey, it was shown that any increase of speed diminished the amount of work done, in a greater ratio than it was affected by an increase of the load. In drawing loads the weight of the animal

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was a point of considerable importance; and when extra exertion and muscular action were required, the nearer horses approached to "thorough bred," the greater was the result.

Mr. Davidson gave the following statement of the work performed by a London brewer's horse per day; the cost of feed and of wear and tear per horse per annum, being derived from actual experience among a large number of horses at Messrs. Truman, Hanbury, and Co.'s brewery.

The feed, &c. is supposed to have cost the same per quarter, per truss, &c. each year.

Years.	Lbs. weight drawn 6½ miles per Horse per day.	Lbs. weight drawn 6½ miles per Horse returning per day.	Average lbs. weight drawn 13 miles per Horse per day.	Cost of Feed and Straw per Horse per annum.	Difference per Horse, Horses bought and sold per ann.
	lbs.	lbs.	lbs.	£. s. d.	£. s. d.
1835	5,148	1,716	3,342	43 2 7	10 0 3
1836	5,072	1,707	3,389	43 16 6	9 18 0
1837	..	..	..	..	..
1838	5,057	1,698	3,377	41 18 0	9 15 9
1839	5,287	1,740	3,513	42 9 11	9 7 1
1840	5,786	1,820	3,803	46 11 7	7 17 11
1841	5,311	1,750	3,530	45 0 1	10 16 11
1842	5 263	1,740	3,501	47 0 9	10 8 0
Total	36,924	12,171	24,545	309 19 5	68 3 11
Average for 7 years nearly -	5,275	1,738	3,506	44 5 7	9 14 10

Mr. Horne stated that Messrs. Tredwell had a contract on the South-Eastern Railway, near where Mr. Simms' experiments were made: they had upwards of 100 horses, whose average cost was about £30; they were worked 10 hours per day, and were well fed, so that their value was but little reduced, and they were eventually sold for nearly the same prices as they originally cost.

These contractors had about 400 horses on the Southampton Railway, which cost them about £25 each. The same course of not over-working, and of feeding them well, was pursued from motives of economy; and they found it answer.

It was Mr. Jackson's practice to keep so many horses for his work as not to be under the necessity of working them more than 10 hours per day; he gave to each a peck of corn a-day; by this means he has been able to keep up their value.

On the Chester and Crewe Railway he had about 300 horses at work, and towards the end of the contract, owing to circum-

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stances over which he had no control, he was obliged to work them 14 or 15 hours per day; and in the course of four months, horses that had been worth £25, were so reduced as not to be valued at above £7. He is a great advocate for steady work and good keep.

On the Tame Valley Canal there had been sometimes between 300 and 400 horses, but as the work was nearly finished, many had been sold. Those sub-contractors who had kept a sufficient number of horses for the work, so as not to have them in harness more than 12 hours per day, had realized nearly the same prices they had given for them in the first instance.

The horses belonging to Mr. Edwards, the sub-contractor for the excavation of Newton Hill, and those of Mr. W. Tredwell, sub-contractor for the Friar Park Farm cuttings, were purchased from the same parties at prices varying from £20 to £35. The former had been acting on the principle of getting out of the horses all he could, working them frequently 15 and 16 hours at a time; and the consequence was, that all his stock was in bad condition, and he would be glad to get £6 or £7 a-piece for them. On the other hand, Mr. W. Tredwell, who was an excellent horse-master, and who did not work his horses beyond their strength, would be able to sell them for about as much as he gave for them,—indeed he had done so already for those that he had parted with.

Having been a good many years in the service of the late Mr. Mc Intosh, Mr. Horne could state that it never was his system to over-work his horses. It did sometimes happen that there was no alternative, but the deviation from the regular rule in every instance showed that his system was founded on right principles. The over-worked horses were most liable to disease, and the time lost by illness formed an important item; whereas there were plenty of instances in which horses that had worked their regular 10 hours per day, and had been properly fed, had worked for five or six years without losing a single day by illness. On the whole, he felt convinced that, both on the score of humanity and economy, the horse was the more valuable servant when treated with kindness.

Mr. Beardmore said that a case had occurred in a work near Plymouth, which he believed would give the fair value of the work actually performed daily by a horse for a considerable period.

A quarry-waggon, weighing 2¼ tons, carrying an average load of stone of 5¾ tons, was drawn by one horse along a railway 960

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feet in length, 260 feet of it being level, and the remaining 700 feet having an inclination of 1 in 138: during 48 working days the number of trips was 1,302, or an average of 27·1 trips each day; the time of performing each trip was 4 minutes, or at a speed of 2·72 miles per hour; and the total weight drawn, including that of the waggons, was 23,959,600 lbs.

Repeated experiments proved, that upon the incline of 1 in 138, the waggons in their ordinary working state would just remain stationary; the friction was therefore assumed to be 16·2 lbs. per ton; by calculation it was found that the horse raised 39,320 lbs. 1 foot high per minute during the eight working hours each day; the useful effect, or net amount of stone carried, being 21,738 lbs. raised 1 foot high per minute. This difference between the work done and the useful effect, arose from the necessary strength and weight of the waggons.

The animal employed was a common Devonshire cart-horse, eight years old, 15 hands high, and weighed 10¾ cwt.; he continued doing the same work throughout a whole summer, remaining in good condition; but a lighter horse was found unequal to it.

ACCOUNT OF A NEW MACHINE FOR ROVING FLAX.

Communicated by Mr. W. K. WESTLY, of Leeds,
(Flax Machinist.)

THE SLIVER ROVING is a recent invention, in which the method of roving flax is pointed out by the peculiar nature of the material itself: it has manifold advantages, which are obtained by means of remarkable simplicity, and, though more comprehensive in its application than any other machine for the same purpose, yet its use is attended with little trouble, and it requires no previous knowledge to enable any one to use it.

It is known that the glutinous matter of the plant may be softened by water, and hardened again by heat; of this fact, advantage is taken in order to produce a roving, wholly without twist; that is, in the form of a ribbon or sliver, in which the fibres are held together by the glutinous matter which may be natural to them, or which may, for that purpose, be artificially applied. The sliver roving, as long as it remains dry, possesses

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all requisite tenacity, but on being again wetted in the spinning frame, it readily admits, with a slight force, of being drawn into yarn. In the diagram in Plate VII., *a*, is the drawing roller of the roving frame in front of the usual comb; *b*, the pressing drawing roller; *c*, a shallow trough of water; *d*, a cylinder heated by steam; *e*, a plain iron roller for winding; *f*, a bobbin, lying loose upon the winding roller, and revolving upon it by the friction of its own weight.

The roving or sliver, as shewn by the dotted line, after leaving the drawing rollers *a*, *b*, passes through the water in the trough *c*, which softens the resin of the fibres, and then it is carried round by the steam cylinder *d*, which dries it, and delivers it, hard and tenacious, to the bobbin *f*, on which it is wound by the action of the roller *e*.

This is the whole of the mechanism required in producing the sliver roving. All the complex arrangements of the common cone roving are superseded, and the machine at once becomes incomparably more durable and easier to manage; requiring only half the motive power, and occupying only half the room. A frame of 48 bobbins is only 6 feet long, and affords rovings enough for 1,200 spinning spindles.

The machine is very general in its application, being equally well adapted for heavy, as for fine rovings.

In making a roving in the usual way, the twist, in addition to other circumstances, sets a limit to the degree to which a material of a given fineness may be roved; because the quantity of twist required to give a roving the requisite cohesion, increases, in proportion as the number of fibres composing that roving diminishes, till it accumulates to that quantity, that the fibres are prevented from drawing regularly,—or if drawn, are broken or scattered asunder by the violence of the action. In the sliver roving there is no difficulty in making a roving of almost any fineness, with little reference to the quality of the material, because while one fibre can be glued to another, a roving may be made.

It becomes easy with a sliver roving to use a double or triple roving on the spinning frame. The great advantage of this practice has long been well known and acted upon, in the spinning of cotton, but in that of flax, it has hitherto been unattainable; yet the vast benefit to be expected, from doubling on the spinning frame, all the equalization of the previous preparation, is too self-evident to be insisted upon.

The sliver roving, made however fine, is perfectly solid, tena-

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cious, and compact: no fibres in it, when once laid straight, can afterwards be ruffled; and as they are placed into the yarn, in the exact position in which they leave the combs, without any ruffling or tangling from twist, the inelastic nature of the material is not injured, and the yarn acquires a superior gloss and smoothness.

The sliver roving is drawn with less force than the twisted roving, and is therefore less liable to make snarls in the yarn; but it has another advantage arising from the absence of twist. The fibres of flax and tow, being various in length, an uniform twist upon them, will naturally retain the longer fibres more effectually than the shorter ones, which will hence have a tendency to run into thick places in the yarn. From this inconvenience the sliver roving is completely free.

In the spinning frame there is also a benefit derived, from the crushing action of the detaining rollers: the pressure is supposed to split the fibres laterally, and thereby make them finer; but it is evident that in a twisted roving, a portion of each fibre must escape this action by winding round the body of the roving, and consequently the fibres can be but partially split. By this circumstance, in addition to the direct loss of benefit, a new and serious evil is created; a split fibre, has always, in the split portion, one end longer than another, and the longest end, of course, arrives first at the drawing roller. Now, if the fibre be only partially split, (if the end that arrives first be not wholly separated from the rest of the fibre,) it follows that when the longer end is seized by the drawing roller, the shorter end will be drawn into a knot or thickness; because its fore end is held back by the adhesion of its neighbours, while its hinder end is drawn forwards by being still attached to its original fibre. In the sliver roving the fibres, being perfectly straight and parallel, are exposed to the crushing action of the rollers equally, and are split uniformly from end to end.

The sliver roving, being so much simpler in construction than any other, is capable of running quicker; but if running only at the same speed, it will produce from 20 to 30 per cent. more work, because it is never stopped, in order to be doffed. The bobbins are so placed, that the attendant has only to remove a filled bobbin, and replace it with an empty one, without the slightest interruption to the progress of the machine.

Each bobbin has in fact its own regulating motion independent of the rest, and which is at all times correct, without requiring any fresh adjustment or adaption to different thicknesses of ro-

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ving; and this enables the spinner to rove, at the same time, as many sorts or thicknesses of roving as there are bobbins on a frame; whereas, on the common machine, he is compelled to rove but one sort, or thickness at a time, and each time that he alters the sort, the mechanism requires a fresh adjustment: these changes are not effected without loss of time, and waste of material.

Scientific Adjudication.

LIVERPOOL ASSIZE,—September 2d, 1843.

BEFORE MR. JUSTICE CRESWELL.

WOOD PAVEMENT.

STEAD *v.* WILLIAMS *et al.*

Counsel for the Plaintiff, Mr. Martin and Mr. Webster.—For the Defendants Mr. Higgins and Mr. Warren.

This was an action brought by Mr. David Stead, patentee of wood pavement, against the Commissioners of Highways and Paving, in Manchester, for the alleged infringement of two patents granted to the plaintiff; the first dated 19th May, 1838, for "making or paving public streets and highways, and public and private roads, courts, and bridges, with timber or wooden blocks;" the second, dated 23rd April, 1839, for "an improved mode or method of making or paving public streets and highways, and public and private roads, paths, courts, and bridges, with timber or wooden blocks."

The infringements complained of, consisted in the commissioners having laid down three several portions of wood pavement in the town of Manchester, which pavements were said to be made in imitation of those described in the plaintiff's specifications of the above patents. The first referred to laying down, in Port Street, a portion of wood pavement, consisting of hexagonal blocks, fitting closely together, side by side, the fibres of the wood being vertical, and forming a level surface on the top; the second, laying down a large extent of the same kind of hexagonal blocks of wood in Dean's Gate, in the same town; and the third

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for laying down in St. Ann's Square, in Manchester, another kind of wood blocks, square on the top, and rhomboidal in form, the fibres being inclined from the perpendicular; which was done for the commissioners, under the direction of the Metropolitan Wood Paving Company.

The portion of paving laid down in Port Street appeared to have been made under licence from the patentee, therefore that part of the question was abandoned. The portion laid down by the Metropolitan Company, was of a form said to resemble some of the figures in Stead's second patent, but the plaintiff thought proper to support his action solely on his first patent, which was for "hexagonal blocks of wood, the fibres being erect;" therefore the second patent was withdrawn by the plaintiff at the commencement of the trial, upon which counsel claimed a verdict for the defendants, as respected infringing the second patent, which was accordingly admitted, thereby exonerating the Metropolitan Company (as it was presumed) from having infringed by using the inclined rhomboidal form of block laid down by them.

The question, therefore, resolved itself into the second alleged infringement, viz., whether the commissioners had infringed Stead's first patent, by using, without license, hexagonal blocks in Dean's Gate, which blocks being proved to be exactly like those described in Stead's first patent, necessarily must be admitted as an infringement of the plaintiff's right, if his said patent was valid.

The plaintiff asserted himself to be the first inventor or introducer of wood paving in England, thereby claiming not only his particular hexagonal block, but also every other variety of form of wooden block used for the purpose of paving. There appeared to have been no less than thirty-eight patents for different kinds of wood pavement, granted subsequently to Stead's of 1838, all of which must be considered infringements if the broad claim of wood, as a pavement, could be maintained by the plaintiff.

The defendants denied that they were guilty; denied that the plaintiff was the first inventor of wood pavement, as it had been known and used before the date of his patent, and, therefore, was not a new manufacture, within this realm; they also denied that his invention was useful to the public, and asserted that it was not properly described in his specification; and further, that the exclusive use of wood, as a pavement, was too large to be maintained under a patent.

The plaintiff proved the laying down of the wood pavement in

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Dean's Gate, Manchester, by the defendants' agents, in August, 1842; it consisted of hexagonal blocks of wood; also the pavement in St. Ann's Square, Manchester, laid down by the Metropolitan Company, which consisted of rhomboidal blocks of wood, square at the top, but standing inclined at an angle from the perpendicular. None of the plaintiff's witnesses had known any practical wood paving existing in this country prior to the date of the plaintiff's patent of May, 1838, and had considered, up to that time, that wood, for paving, would not be suited to this climate.

The subjects intended to be introduced by the defendants, in answer to the plaintiff's pleas, were, in some degree, anticipated by the plaintiff's counsel, who insisted that Finlayson's project of wood pavement was expensive and subject to injury; that Heard's was a mere project not carried into effect, and that the forms of paving blocks, described in Macarthy's and Macnamara's patents of 1818, 1821, 1825, and 1837, made of "stone or other *suitable materials*," did not anticipate blocks of wood.

The defendants complained of the hardship of being brought, at great expense, before a Liverpool Jury, to try a question as to wood pavement, where its usefulness was scarcely known; whilst, for more than four years, the Metropolitan Company had, without molestation from the plaintiff, been exercising their patent in London to the extent of many thousand yards, and where its merits are fully understood and appreciated; besides which they had, in several instances, as in the Old Bailey, been employed to remove Stead's hexagonal pavement, which had been found defective, and to replace it with their own rhomboidal blocks.

In denying that wood pavement was new and a legitimate subject for a patent, when introduced by the plaintiff, they produced a letter, accompanied by certain figures of wooden blocks, written by Mr. John Finlayson, of Ayrshire, North Britain, and published in "Newton's London Journal of Arts," in March, 1825, in which the writer says: "Conceiving then that the public will very soon be convinced that nothing but a staple material will answer for road-ways in the metropolis, I shall dismiss the consideration of Mc Adam's plan, and without further preface describe the mode by which I propose to remedy existing evils, and to form a road that shall be stable, durable, clean, and prevent that astounding noise which is so extremely annoying, not only to strangers, but to the inhabitants themselves." He then explains his drawings, which represent, in plan and elevation, a portion of paving, made of blocks of wood, placed with the grain vertical, and made fast

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upon the ground, by their lower ends being inserted tightly into rectangular frames of iron; the interstices, between the blocks above, being filled with gravel. "These blocks may be of any kind of wood that would answer for that purpose, though I should prefer larch fir, as that is less likely to decay than most other woods, and is more tough and difficult to be split or torn asunder; and when kept damp, as it naturally would be whilst in the earth, would last for ages."

"The dimensions of these wooden blocks might be about eight inches square, on their top surface, and about eighteen inches high; their form, as seen in the section, should be slightly tapering from a little below the middle downwards, for the purpose of fitting solidly into the recesses of the iron box; and also slightly tapering upwards, from the same part as shewn in the section, for the purpose of allowing gravel or broken stones to be introduced between the wooden blocks, when fixed, in order to wedge and confine the blocks firmly, and prevent them from being shook or displaced by the carriages, as they pass over."

The writer then proceeds to explain other particulars as to forming the bed or foundation of the road, and concludes with a series of observations, pointing out the merits and advantages of paving streets with blocks of wood.

The defendants proved by evidence, that a portion of the said wood pavement had been laid down by Finlayson, in Edinburgh, and publicly used there in 1825, which counsel argued was a public use within this realm, according to the decision before the Privy Council in the cause "Brown *v.* Annandale." To the conclusion drawn from this case,* however, the Judge demurred.

A published letter was then produced, written by Mr. Heard, of Blackheath Hill, which had been printed in the Society of Arts' Transactions for the Year 1833.

Blackheath Hill, October 6th, 1832.

"SIR.—It is doubtless the duty of every traveller in foreign lands, to observe attentively the improvements that have been made in useful arts in the various places through which he may pass; and when he perceives anything conducive to the happiness, comfort, or prosperity of a people, unknown at home, to communicate the same, for the general benefit of his fellow-countrymen.

"Under this impression, I take the liberty of soliciting that

* For full particulars of this decision, see Vol. XXI., p. 274, and 372; also Webster's Reports of Patent Cases, p. 433.

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you will lay before the Society of Arts, &c., the following account of a mode of constructing roads in cities, hitherto totally unknown in England, and by far the most perfect that has come under my notice. I think no person will deny that it is desirable to have the streets of towns so paved, that, in dry weather, there should be no dust, and in wet weather no mud, and as little noise as possible from the passing of carriages. All these advantages are combined in the kind of road I allude to, besides being smoother than a Macadamised road, even when the latter is in a most perfect state.

"In countries abounding in wood, various schemes have been adopted for the formation of roads of that material; but hitherto they have always been made by laying logs or planks parallel to, or at right angles with, the sides of the way; these logs were easily displaced, and soon cut up by the horses' hoofs, and when once out of order, no road can possibly be worse. The improved road, on the contrary, will last five or six years without repair, and, were it not for the high price of timber in this country, might be adopted with the greatest advantage; and being a plan of considerable national utility, possibly the government might be induced to allow the importation of timber, for this purpose, duty free.

"The following instructions will be found sufficiently practical and explicit, as a guide to the construction of roads on this principle:—

"First.—Prepare a hard and level bed of gravel or broken stone, covered with sand, and well rolled, about nine inches lower than the intended surface of the road.

"Second.—Take logs of timber of sufficient diameter, and by means of equidistant circular saws, cut them into equal lengths of one foot each.

"Third.—These round logs must now be passed under a sexangular steel stamp, which cuts off the outside of the log, and leaves little more than the heart of the tree, in the form of a sexangular block.

"Fourth.—Two sides of this block must now be bored three inches deep, with an inch borer, for the reception of a wooden pin, six inches long, which is to be driven into the hole already prepared in the log; the three inches of the pin which project, being inserted in the next log. The operation of laying the blocks of wood and driving the pins, proceeds rapidly, and the surface of the road soon assumes a beautiful checquered appearance, some-

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what resembling an inlaid floor; and the fibres of the wood standing vertically and not horizontally, there is not a possibility of splintering. The whole is held compactly together by a narrow strip of stone pavement, and nothing now remains to be done but to cover it with a thin coat of boiling tar, and on the tar a fine layer of sand, by which means every interstice is completely filled up, and moisture excluded.

"In addition to the advantages, already mentioned, of never being either dusty or muddy, this road is little inferior to a railroad, in point of smoothness; so that it may be safely asserted that one horse will easily draw on it the burden of two.

"If at the end of five or six years (where the traffic is great) the road should be so injured as to require repairing, it may be done by taking up the logs, sawing a new face, and replacing them, when the road will be again equal to new.

"The one which I saw constructed in the above-mentioned manner, was in one of the most frequented streets of a populous city; and when I left that country, had stood between three and four years unimpaired.

"Should any further explanation or instruction be required, it will be most readily furnished by, SIR,

Yours, &c. &c.

"A. AIKIN, ESQ. JAMES HEARD."
Secretary, &c."

The counsel for the defendants now submitted to the witnesses this letter from Mr. Heard, and desired them to compare it with the specification of the plaintiff's patent, which states that "the invention consists of a mode of paving by means of wooden blocks, cut or formed of similar sizes or dimensions. And in order to give the best information in my power, I will proceed to describe the drawing annexed, which represents part of a road or other similar surface, laid down with blocks of wood of a sexagonal figure, which figure at once offers the advantage of joining together, and also that the lines of junction proceed in varied directions, by which the blocks of wood will sustain each other more securely than if formed of any other figure; I do not, however, confine my claim to sexagonal blocks, as triangular or square blocks, placed diagonally, may be used with advantage. And in order further to secure the blocks from sinking or getting displaced, I employ dowels or pins to each block, as is shewn in the drawing, though I do not consider this requisite in all cases.

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"The blocks of wood are to be placed on the earth, or formed with the grain of the wood in a vertical position; and in applying such blocks as a paving, the surface of the road, or other such way, is to be prepared in as solid a condition as possible, and to the figure or intended slopes; and the blocks are successively to be applied, having sand or other fine filling; driving each block up to those against which it is to rest, having first introduced the dowels or pins, which I prefer to be of oak. And, it should be stated, that the wood I make use of should be of a hard and solid texture, such as oak, pine, beech, &c., and that the size of the blocks I prefer for public roads and streets, is about 7 to 10 inches diameter at top, slightly diminishing to the base,—and about 9 to 12 inches in height. And I prefer that the wood employed should be first boiled in tar, or saturated by other suitable material, acting as a preservative to the wood; and it will be found advantageous to fill up the interstices between the blocks of wood with melted pitch, or pitch and sand, or earth, combined; though this is not essential,—and I make no claim for such using of pitch and sand, or earth."

A block of wood was then produced which had been taken up from a carriage road contiguous to the mansion of Sir William Worsley, in Yorkshire, where a road had been formed some years prior to Stead's patent, by the combination of wooden blocks, of hexagonal forms, like those described; and which road still remains in good order. Several of the witnesses, being questioned as to the similarity of the hexagonal block from Sir W. Worsley's road in Yorkshire, and those described in Mr. Heard's letter, and in the plaintiff's specification, said they could perceive no difference.—The Judge expressed his opinion that they were identical.

Other instances of the existence of roadways formed of wood, prior to the date of Stead's first patent, were proved, particularly on Hammersmith Bridge, but no patent appeared to have been granted expressly for forming the surfaces of roads, streets, and other public and private ways, by combining blocks of wood, until Stead's patent of May, 1838.

The defence being concluded, the Judge addressed the Jury as follows:—

SUMMING UP.

Mr. Justice Creswell: "Gentlemen of the Jury.—

"You will have several matters to dispose of in this case. The plaintiff complains that he, being entitled to a patent right to wood pavements, the defendants have infringed that patent; and no doubt the defendants have

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done that which would amount to an infringement, if the patent right be good. They have exercised that for which the patent has been granted to the plaintiff; and, therefore, upon the question of 'Not Guilty,' which is the first answer the defendants make, the verdict must be against them. They say that the plaintiff was not the inventor; and that plea was founded upon the passage in the statute of James, which is the only authority the Crown has to grant monopolies—that it must be granted to the true and first inventor. If, therefore, you should be of opinion that the plaintiff in this case was not the inventor of this mode of wood paving within this country, he is not entitled to a verdict upon that issue. If he derived the information from a foreign country, that would leave him still the true inventor within this country, provided he did not derive his information from any person here. But if he derived his information either from books or from oral communication in this country, which he had given to the public, or which some person had given to him, and he having invented it, then he is not the true inventor, and is not entitled to the patent. Now, upon that subject, it is argued before you for the plaintiff, that he states in his patent that he derived his information from a foreigner. That is a fact that the Crown granted the patent upon that representation, but it is the plaintiff's own statement, and he has not produced any evidence to confirm it; he has not shewn you any communication that he received, or called any witnesses to depose as to who gave him the communication. On the other hand, the defendants say that the scientific books published throughout England, contained statements before, which essentially communicated to the public all the information which the plaintiff himself has given; and if he, from such communications, derived that knowledge which enabled him to take out this patent, he cannot convert to his own private use that knowledge which has before been given to the public. But then the defendants do not bring home to the plaintiff the fact of his having seen any of those publications; and it is for you to judge, upon the whole of the matter, whether you think that he had seen these publications, and had derived his information from the stock of knowledge previously given to the public of this country, or whether he derived it from some persons residing abroad, and, therefore, having a source of information which is considered as equivalent to his own invention. It does not deprive a person of a right to a patent that another person has the same thing in his head, even supposing he has heard it at the same time, provided he himself is an inventor; but if he is not an inventor, but a mere operative carrying out that invention, which another has published, then he is not entitled to the patent. Now upon that subject—upon this part of the case, I must draw your attention to this communication, and you will have two questions to deliberate upon respecting them:—first, whether they come to the knowledge of the plaintiff; and, secondly, whether, if they did, they disclose that for which he claims a patent; because, although he may have read those, if they do not disclose that which is the essential part of his patent, then it does not invade at all his privilege of having a patent right. Now Mr. Finlayson's is the first of these publications published in March, 1825, in 'Newton's London Journal of Arts and Sciences.' It appears to be a work circulated, to a considerable extent, amongst scientific people, to the extent of seven or eight hundred, and to be in almost all the scientific institutions of this country. He suggests a novel method of laying down a road which would be suitable to the streets of London, and other great towns. 'The principal materials of which I propose to make my road is wood; but let not the idea be hastily discarded, because so perishable a material is to be employed, until my views in so doing, and plan of applying it, are fully understood.' Then he describes to you the mode of applying it. It is to be applied in iron partitions; 'an oblong box, made of cast iron, with cross partitions, leaving eighteen sockets, into each of which a wooden block, the grain upwards, is to be inserted, for the purpose of occupying the place of the ordinary paving-stones.' As far as the vertical position of the grain

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goes, here it is clearly stated, 'the grain upwards is to be inserted, for the purpose of occupying the place of the ordinary paving-stones.' Then he describes their dimensions, that they shall be about eight inches square and about eighteen inches high; their form, as seen in the section 7, should be slightly tapering from a little below the middle downwards, for the purpose of fitting solidly into the iron box, and then slightly tapering upwards, in order to allow a certain portion of gravel, or other binding substance, to be rammed in between them. In that respect they differ from this, the object of this being to keep the surface, if not the sides, as close together as possible. Probably you will think the design is to keep them close, on account of the dowels that are to be inserted to keep them together. Then, he says, 'the iron boxes may be about four feet and a half by two and a half.' He describes them and the formation of the bed for them, 'by rolling, ramming, or otherwise, so as to be perfectly solid.' That I should suppose to be a thing not very likely to escape any person who is preparing for a matter of this sort. Then he says that the great difference between that scheme and the present is, that there the one main ingredient appears to have been the iron box into which the wood is to be inserted; there is to be an iron box, having cross bars in it, and each division is to hold one of these blocks, and the whole scheme would be mainly dependent upon that; but still, to a certain extent, this discloses a scheme for paving with wood, with the grain vertical, and with a certain number of dowels, to be bound together, partly by gravel, rammed in between them, and partly by means of an iron frame, into which they are to be inserted:—That is in 1825. Nothing comes of that; nobody seems to have taken any notice of it until 1832. Then, James Heard seems to have written a letter to the Society of Arts in London, for which he received their thanks; and, at that meeting, it appears that they vote him their thanks, for his letter describing a wooden road in St. Petersburgh; and this does appear, as far as I can judge, to describe with the greatest accuracy that which is described in the specification of the present plaintiff. 'In countries abounding in wood, various schemes have been adopted for the formation of roads of that material; but hitherto they have always been laid by laying logs, or planks, parallel to, or at right angles with, the sides of the way. Those logs were easily displaced, and soon cut up by the horses' hoofs; and, when once out of order, no road can possibly be worse. The improved road, on the contrary, will last five or six years without repair, and, were it not for the high price of timber in this country, might be used with advantage; and, being a plan of considerable national utility, probably the Government might be induced to allow the importation of timber, for this purpose, duty free. The following instructions will be found sufficiently practical and explicit, as a guide to the construction of roads on this principle:—First, prepare a hard and level bed of gravel, or broken stone, covered with sand, and well rolled, about nine inches lower than the intended surface of the road.' Here you are to have the road. The road is to be 'prepared in as solid a condition as possible.' That is much the same thing. In this it is to be covered with sand, and is to be about nine inches lower than the intended surface of the road. 'Secondly, take logs of timber, of sufficient diameter, and, by means of equidistant circular saws, cut them into equal lengths of one foot each.' These were to be nine inches,—that is perfectly unimportant. Then they are to be made sexangular. He proposes, by means of a stamp, that they are to be brought into that form. This gentleman proposes that they are to be sexangular; but he says, 'I do not claim that form particularly, for either triangular or square blocks will do, the principle being that the sides of the different parts may fit in against each other.' 'The two sides of this block must now be bored three inches deep, with an inch borer, for the reception of a wooden pin, six inches long,—that is the dowel precisely 'which is to be driven into the hole already prepared in the log, the three inches of the pin which projects being inserted into the next log. The operation of laying the blocks of wood and driving the pins, proceeds rapidly; and the

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surface of the road soon assumes a beautiful chequered appearance, somewhat resembling an inlaid floor; and the fibres of the wood standing vertically, and not horizontally, there is not a possibility of splintering.' A remark was made upon that, that it is to be covered with sand, a bed of gravel, or broken stone, and well rolled, about nine inches lower than the intended surface of the road; from which it is to be concluded, that these pieces were to be rammed in with a rammer. That could not be—they must have been driven horizontally, because he proposes to have a pin binding the two together; that could not be if they were rammed down. The plaintiff does not insist upon the pin; therefore, perhaps, they might, in some instances, be rammed down. I dare say they are so; no question was asked about that; but this person insists upon the pin in all cases, therefore they must be driven horizontally. Probably, therefore, he provides for that—sand, as of a looser substance, because, when they are driven horizontally, a certain portion must be driven up, instead of pouring all in from the top. 'The whole is held compactly together by a narrow strip of stone pavement; and nothing now remains to be done but to cover it with a thin coat of boiling tar, and on the tar a fine layer of sand, by which means every interstice is completely filled up, and moisture excluded.' That appears to be simply for the purpose of excluding the moisture. In this, 'they are to be boiled in tar, or saturated by other suitable material, acting as a preservative to the wood;' and he says, 'and it would be found advantageous to fill up the interstices between the blocks of wood with melted pitch, or pitch and sand, or earth combined, though this is not essential;' therefore he recommends precisely the same thing from the beginning to the end. Certainly I am not able to discover the very slightest difference between the one and the other. Now, when you are speculating upon whether a man has taken his scheme from some particular publication, or not, it is material to consider how far that scheme corresponds with that, or not. If you find it identical, certainly it tends to raise the supposition that he had seen it. It is an old vulgar expression, that 'great wits will jump;' and two men may have hit upon precisely the same scheme; but here are several particulars, and it is for you to consider—it may assist you in judging somewhat—where you think he got the information. On the other hand, it is said, this information which Mr. Heard furnished, he brought himself from St. Petersburgh; therefore the correspondent of Mr. Stead might have brought that information from St. Petersburgh. So he might; but that has not been proved to you. I do not mean to say any thing against the veracity of Mr. Stead. I know nothing of the gentleman; but I am only bound to tell you here that you have nothing for it but the recital in his own patent, which would be evidence against *him* that the Crown granted that patent to him upon that representation; but in a question between A and B, I do not see how A's own statement can be taken as proof. Then, again, this appears to have been published in 1833. That, again, lies dormant for some time; no notice is taken of it; nobody acts upon it. That is certainly a circumstance in favour of Mr. Stead. Then you have the subsequent notice, published in March, 1834:—'Mr. James Heard, of Blackheath, states, in a communication to the Society of Arts, published in the last part of their Transactions, that he had seen, at St. Petersburgh, some excellent specimens of street-paving, formed of wooden blocks, set with the grain upwards.' He says, he could name the person who so communicated that information, and refers to Finlayson's letter. This is only important, as showing to the scientific world that both these communications, from Finlayson and Mr. Heard, were noticed, and were the subject-matter of discussion. That being so, it is upon that evidence that you are to decide whether Mr. Stead derived the knowledge which enabled him to take out this patent from that which was part of the common stock of knowledge of this country, but was his own solely as far as this country was concerned. If you are of opinion, even upon this question, as to his being the true inventor, you must find for him; if you are not satisfied of that, you must find for the defendants on that issue.

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Then the next question that comes is, whether he is the inventor of a new manufacture? Now that is for the purpose of raising the question, whether paving with wood can be the subject-matter of a patent? Upon that question, it is simply a question of law whether it can be the subject-matter of a patent? I propose to state, as my opinion here, that it is so; and then, if it should be necessary, the defendants may move the Court, and take their opinion upon that ground. Then, as to the invention not being of use to the public, whereby the patent is void, I think, gentlemen, the subject of *not being of use*, has been somewhat misunderstood at times. It has not been pressed here to-day beyond its legitimate limits; and it is now conceded that this wood-paving is of use, so as to justify the granting of a patent. So far as that goes, therefore, that would be found for the plaintiff. Then 'that the plaintiff did not particularly describe and ascertain the nature of his invention, and in what manner the same was to be performed, in his specification.' It is necessary that every person who takes such a patent should, within a certain time, give to the public information which will enable them to exercise that patent-right, when the term for which it is granted has expired; and you have had evidence, that any common workman, from the specification, could lay that pavement as described by the plaintiff. I think there is no doubt about that—indeed, it is so simple a thing, that, when once told, it is a good deal like Columbus's egg. Then comes this question, that long before the patent was granted, the invention was publicly known in this country. Now, as to its being publicly known in this country, I take it that there is a great difference between the knowledge of it as a thing that would answer and was in use, and the knowledge of it as a mere experiment, that had been found to be a failure, and thrown aside. If you are dealing with an article of merchandize, or with an article of ordinary use—if a person has had a scheme in his head and has carried it out, but after a trial has thrown it aside, and the thing is forgotten and gone by,—then, another person re-introducing it, may, within the meaning of this Act, be the inventor and the first user of it, so as to justify a patent. There is one instance where a patent was taken out for wheels, on the suspension principle, bearing a proportion of the weight from the upper rim of the wheel, as well as supporting on the spokes below perpendicular pressure. It was proved in that case that Mr. Strutt, of Derby, had used a cart, with wheels upon that principle, some time before. After using it for a year or two, he threw it aside. It was totally forgotten; and some fifteen years afterwards, a man brought the thing to perfection, and took out a patent; and it was held, that that former use by Mr. Strutt, having been abandoned as a useless thing, was no impediment in the way of a patent right. So, also, in the case alluded to of *Cornish* v. *Keene*. An attempt had been made to introduce new elastic matters combined, for the purpose of making braces and bandages, and various articles of that sort. I remember well, in that case, the Chief Justice left it to the jury to say, whether these were mere experiments. Some pieces were actually produced which had been manufactured, and some of those things which had been manufactured had been sold. It was left to the jury to say whether that was an introduction of it so manifest, or whether it was a mere failing experiment, which had been abandoned, so as to leave the way open to any new speculator in it, who yet might bring the patent to perfection. In that case, also, the patent was supported. This is a different case here. In order to negative the first use, they have given some evidence of similar pavements in Surrey, Somersetshire, and somewhere else. The ends of fir, or oak, or other things of that sort, just in their natural condition—round, driven down to make a firm flooring, either in small houses, fronts of doors, or something of that sort. Undoubtedly a very different thing from this, and no further affecting this question than as shewing that wood had, in some trifling instances, been used as a pavement; but as a pavement for a carriage-way, none of these things appear to have been used.

But then comes the question of Sir William Worsley's. Now, the prin-

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ciple of that may, or may not, involve entirely the principle of this, according to your judgment. It appears to have been laid down to support the traffic of carriages in a small place, undoubtedly; a portico, which was covered in—the porch to the dwelling-house of Sir William Worsley, in Yorkshire. Undoubtedly it has been put there to sustain the traffic of carriages; that there is no doubt of. They are cut into hexagon blocks, of equal size. There you have the principle of the angular parts corresponding, so that the flat surface would come together, and so sustain each other from any lateral motion. They are not driven horizontally against each other, but driven in from the surface, and there are no dowels; but dowels are not claimed as any part of the present invention. Then if you think (though that is a little more bevilled off)—if you think that is essentially the same thing as the hexagon block introduced by the plaintiff, for the purpose of making roads, then I should say, in point of law, that makes an end of the patent, because that appears to have been introduced by Sir William Worsley, or to have been used by him in public—not concealed—no secrecy about it—made known to all persons who came to his house, so far as their ocular inspection could make them. It was intended to be public, not to be made a matter of merchandize, certainly, but merely for his own private use; but the knowledge of it exposed to the public an article in public use, and continued to be used down to the time in question. Therefore, if you think that is the same thing in substance as that which the plaintiff claims, I think that it was publicly used before, and that, therefore, he cannot have this patent. Whether it had been used by one, or used by five, I do not think it makes any difference. If I am wrong in that respect, I have stated my opinion distinctly, and that may be corrected. I know that it has been matter of much controversy whether that is so or not. I have seen some very sensible observations upon the subject, perhaps not altogether corresponding with the view I now take of it. But, however, that is my opinion, that if you think that pavement, made by Sir William Worsley, is substantially the same thing as the plaintiff's, then your verdict should be for the defendants upon that issue.

There remains one other point, that the title of the invention of the letters patent is too large and vague, and at variance with the nature of the invention described in the specification. That, gentlemen, comes to this,—the title of it is, that it is a mode of 'making and paving public streets and highways with timber or wooden blocks.' Of that there is no doubt—whether it is too vague or not is rather a matter of law than any thing else, and upon that I also say, that I am in favor of the plaintiff. I think that it is not too vague, therefore I advise you to find that issue for the plaintiff. That leaves substantially for your consideration only two questions:—First, are you satisfied that the plaintiff is the first and true inventor thereof, according to those rules which I have laid down for your guidance; and secondly, was it, before he took out his patent, used in public by any person in this country. That I think depends upon the identity of the blocks of Sir William Worsley, in principle, to that which you have now before you.

Mr. Martin.—Your Lordship will bear in mind, there was no proof—his does not taper at the end.

Mr. Justice Creswell.—I believe that is perfectly straight.

Mr. Martin.—I have just enquired how that is about the tapering, because the road is made in that direction; [describing it] it is not intended that they should stand distinct, but that they should stick close together.

Mr. Justice Creswell.—They are tapered, for the purpose of forming a curve on the road; every man knows that.

Mr. Martin.—Your Lordship has correctly stated what it is,—it is for the sake of keeping them close together.

Mr. Justice Creswell.—It is for the purpose of making them meet there.

Mr. Hoggins.—I shall have a verdict on all the pleas which refer to the second patent. My friend abandons the second patent.

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Mr. Justice Creswell.—Yes, if it is worth while. Do you wish me to wait for the verdict?

Mr. Martin.—No, my Lord.

Mr. Hoggins.—No, my Lord.

Mr. Justice Creswell.—If there is a verdict, it is for forty shillings of course.

Mr. Martin.—Yes, my Lord.

The Jury retired at ten minutes past four;—at seventeen minutes to six the Jury came into Court.—Verdict for the plaintiff,—*Damages Forty Shillings.*

Mr. Warren.—[To the Associate Mr. Forrest] You had better ask them how they find those two questions.

Mr. Webster.—No, I object to any question being asked.

The Associate.—[Mr. Forrest] No, I can ask the Jury no question.

ON THE LAWS RELATING TO LETTERS PATENT FOR INVENTIONS.

THE PATENT LAWS OF WURTEMBERG.

No. VIII.

THE kingdom of Wurtemberg being one of the states which form the German Customs Union, or *Zollverein*, most of the regulations, respecting Patents for Inventions, which are in force in Prussia, and the other German States, are observed in that state also. The laws for the protection of inventions or discoveries in Wurtemberg, are, in some points, similar to those of other continental countries; but that state has many regulations and restrictions which appear to belong peculiarly to itself.

The following is a concise account of the law and regulations at present in force in Wurtemberg:—

SECTION I.

THE NATURE OF PATENTS, AND THE RIGHTS AND PRIVILEGES WHICH THEY CONFER; BY WHOM THEY MAY BE OBTAINED; EXAMINATION AND PUBLICATION OF THE SPECIFICATIONS.

ART. 1. *The nature of Patents, and the rights and privileges which they confer.*—Patents may be obtained for inventions, improvements, and importations.

Patents for inventions are granted for new manufactures, products, or articles; and for new processes, or any new method of manufacture, whether mechanical or otherwise.

Patents for improvements are granted for any improvement upon an invention already patented. The proprietor of a patent of this description does not, however, possess any exclusive right over any thing more than the particular improvement pointed

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out in his description; nor can he make use of any part of the process which belongs to the original patentee, without the permission of the latter. On the other hand, the original patentee cannot take advantage of the improvement that has been made upon his invention, without being duly authorized by the second patentee.

Patents of importation are issued for the introduction, into the kingdom of Wurtemberg, of any invention already patented in a foreign country.

ART. 2. *Rights conferred by a Patent.*—The privilege resulting from a patent, insures to him who obtains it the exclusive right to make and use the invention, during the whole term of the patent.

The patentee can, subject to the general laws of the country, work his invention on the most extensive scale; he is not bound to do this in any particular spot, such as in the place or city where he resides, and where he enjoys the right of citizenship; he can, if he please, transfer his rights and privileges, for the whole term of the patent, to third parties, or participate with them in working the invention. If he should die before the expiration of the patent right, all his privileges devolve upon his heirs or successors.

ART. 3. *By whom Patents can be obtained.*—In order to obtain a patent of invention in Wurtemberg, it is necessary to be a resident there; and the applicant must also enjoy the rights of citizenship. Foreigners, consequently, cannot procure privileges of this nature, unless they obtain a special permission from the government for this purpose; which permission will, in fact, be equivalent to naturalization. Minors or persons under age, cannot legally obtain patents, because they have no settled place of residence, and do not enjoy the privileges of citizenship; and females, even if natives of the country, are, for the same reasons, deprived of the right of becoming patentees.

ART. 4. *Of the description of the invention.*—The application for a patent must be made in writing, and addressed to the authorities of the canton or department in which the petitioner resides, or in which he wishes to work his invention. A detailed description of the invention, explained in an exact and faithful manner, and accompanied with illustrative documents, such as drawings, models, specimens, &c., must be attached to the application. The inventor is bound to point out, in this description, the difference between the alleged discovery and the

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processes or means already existing and in use in the manufacture or execution of articles or works of the same nature. If the inventor encloses his description in a sealed envelope, the authorities of the canton or department have no right to open it. He cannot, however, avail himself of this regulation, for the purpose of suppressing any of the principal details of his invention, or of describing them inaccurately, with the view of preserving the secret of his discovery, after the expiration of the patent; for, independent of the danger of having his privilege rescinded, the patentee subjects himself to certain penalties and fines, to which he maybe condemned by the laws of the country, for cheating or deceiv-ing the public.

If the patent is for the introduction of a foreign invention, the specification must be translated into the German language.

Art. 5. *On the granting of Patents.*—The authorities must deliver to the applicant a receipt for the description and other documents, with an indication of the day and hour on which the deposit was made;—this receipt establishes the priority of the application; and the packet and other documents, in support thereof, together with a letter from the authorities, stating the day and hour on which all the required formalities were fulfilled, in support thereof, are immediately transmitted to the Minister of the Interior.

The patent, thus applied for, and supported by the production of the documents before mentioned, will be granted, 1st,—If the invention, or the new processes, connected with the manufacture in question, are not in opposition to the existing laws of the country; 2nd,—If a patent has not been previously granted for a similar invention or discovery; 3rd,—If the pretended invention is not already known and in use in some part of the kingdom.

It must be understood, that the granting of a patent does not prevent any person, interested in that particular branch of manufacture for which the patent has been obtained, from questioning the validity of the patent, for any of the above-mentioned causes, and bringing before a competent tribunal such evidence as may be deemed sufficient to justify a rescinding of the privilege, as will be seen hereafter.

Art. 6. *Inspection or examination of the Specifications.*—The description and other articles or documents, forming part of the invention, cannot be examined without the consent of the proprietor of the patent, during the existence of the patent right; but if any dispute should arise upon the validity of the patent, a

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competent tribunal may order an examination to be made, for its information, before giving any decision upon the case. Any third party may also examine the description, during the last year of the patent right; or, in cases of patents of importation, if the first half of the term, for which the patent was granted, has elapsed. Before this examination, however, the applicant must give proof of his being an inhabitant of the kingdom of Wurtemberg, and of his enjoying the rights of citizenship; he must also declare his reasons for wishing to become acquainted with the invention; and lastly, he must bind himself, under a penalty, not to work the said invention or discovery, without the consent of the patentee, during the whole term of the privilege; and not to expose, to any third party, the secret of the invention, for the purpose of working the same, either in the country or abroad. Before allowing the examination to take place, the proprietor of the patent is apprised by government that an application to examine his specification has been made, and a sufficient space of time is allowed him to enter an opposition against such application, should he think proper.

SECTION II.

DURATION OF PATENTS, AND THEIR PROLONGATION; ACTIONS FOR INFRINGEMENT; CAUSES OF INVALIDITY; EXPIRATION OF PATENT RIGHT.

ART. 7. *Duration of Patents.*—The time fixed for the duration of patents does not exceed ten years. A longer term cannot be granted, unless under extraordinary circumstances, and sanctioned by a special law. Immediately on the granting of a patent, a notice to that effect is published in the official journal.

ART. 8. *Prolongation of Patents.*—When patents are granted for the shortest term, they may be afterwards prolonged for ten years. The application for the prolongation of a patent of invention, must be made before the commencement of the last year of the patent right; and for a patent of importation, before the expiration of the first half of the term for which the patent was originally granted.

The prolongation, as well as the granting of a patent, is made public.

ART. 9. *Actions for Infringement.*—A patentee can bring an action for damages against all persons who, without his authority, make, use, or sell the article protected; or against those who,

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knowing the article to be patented, assist the infringer in making or disposing of the same. All the patented articles, found on the premises of the infringer, are confiscated for the use of the patentee; to whom, also, the amount obtained for the articles already sold must be repaid. Also, persons introducing from abroad any articles which are patented, will be liable to the same penalties.

The proprietor of a patent of importation, who shall have obtained a patent merely for the manufacture, and not for the sale of certain articles, can only have a remedy against the manufacturer, and against any person who, knowing the said articles to be manufactured by an infringer, shall have sold the said articles in the country. Whoever, without an intention of defrauding a patentee, should ignorantly work any invention protected by patent, and should expose the products thereof for sale, cannot be proceeded against by the patentee, until he has been duly admonished not to make or sell the said articles before the expiration of the term for which the patent has been granted.

ART. 10. *Causes of Invalidity.*—A patent of invention is declared void, 1st,—If, before the date on which the applicant placed the description of his invention in the hands of the proper authorities, any other person should have made an application for a patent for the same invention; 2nd,—If the pretended new process, manufacture, or machine, shall have been already worked under the protection of a patent in a foreign country; 3rd,—If it shall have been described in a published book, in such a manner that any intelligent mechanic can put it into execution; 4th,—If any third party shall have made use of the same invention, before the application for the patent. Nevertheless, in this latter case, if the invention shall have been worked in secret by the third party, before the application, the patent afterwards obtained shall be considered valid; but the patentee cannot interfere with those who shall have made use of the invention before the date of his patent.

The forfeiture of the patent will likewise be incurred, 5th,—If the applicant shall omit in his description any of the principal details of the invention; 6th,—If he does not faithfully and accurately describe and set forth the process, manufacture, or machine, which forms the subject of his application; 7th,—If the patentee does not begin within two years after the patent is granted to work his invention in the country; 8th,—If he leaves off the said working for the space of two years, without giving

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satisfactory reasons; 9th,—If he imports from abroad the manufactured articles for which he has obtained a patent; 10th,—If the invention, or the process or manufacture employed, is in opposition to the laws of the country.

Patents of importation are subject to the same regulations and causes of forfeiture as patents of invention; and furthermore, as regards patents of importation, if, from any cause whatever, the patent of invention in a foreign country, for which a patent has been subsequently obtained in Wurtemberg, be declared void,—the latter will share the same fate, and will be also forfeited.

ART. 11. *Expiration of the Patent right.*—Besides the causes of forfeiture above mentioned, the patent will become void after the expiration of the term for which it has been granted, or in consequence of the voluntary cessation of the patentee. Every possible publicity is given to the expiration or forfeiture of a patent, when the said forfeiture shall have occurred before the expiration of the term originally granted. Every inhabitant who enjoys the right of citizenship in the country, has then the right to examine the description of the process which had been patented; and the government may, if they should deem it desirable, order it to be printed.

NEW COPYRIGHT OF DESIGNS ACT.

THE following Notice, relating to the copyright of designs for articles of utility, is worthy of attention, as it proceeds from a quarter we presume to be the best informed on the subject. We may also add, that the misconceptions so general on the nature of the Designs Act, are, in a great measure, owing to the unsatisfactory manner in which the proper subjects for registration are therein defined. To this Notice is also appended a list of the registrations already effected, which will be a further guide for those of our readers who may wish to avail themselves of the protection afforded by the New Act:—

"DESIGNS OFFICE,
"*9th September*, 1843.

"As the Act 6 and 7 Vict. c. 65, applies only to the *shape or configuration* of articles of utility, and not to any *mechanical action, principle, contrivance, or application*, (except in so far as these may be dependent upon, and inseparable from, the shape or configu-

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ration), no design will be registered, the description of which shall contain *a claim* for any such mechanical action, principle, contrivance, or application.

"With this exception, all designs, the drawings and descriptions of which are properly prepared and made out, will be registered, *without reference to the nature or extent of the copyright sought to be thereby required;* which considerations must be left entirely to the judgment and discretion of the proprietor of the design.

"By order of the Registrar,
"J. H. BOWEN,
"*Clerk.*"

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

Sept. 1. *Jonathan Murcott*, of Long Acre, for a carriage lamp.
2. *Thomas Evered Poole*, of Nether Stowey, Somersetshire, for a snaffle curb.
5. *Richard Clyburn*, of Uley Iron Works, Gloucestershire, for a screw-wrench, or spanner.
6. *Frederick Henry West*, of the Eastern Counties Railway, Shoreditch, for a heel tip.
6. *William Pawley*, of 22, Red Lion-street, Clerkenwell, for an eye-glass.
7. *Thomas Penn*, of Bromsgrove-street, Birmingham, for a dove-tail sash-fastening.
8. *James Bullough*, of Blackburn, for a weft distender.
8. *Charles Topham* and *Edmund Alderson Fawcett*, of Derby, for ladies' mits.
9. *Robert Wilkins*, of 24, Long Acre, for a ball cock.
11. *John Clark*, of Little Albany-street, Regent's Park, for a double parabolic reflector.
13. *Thomas Cooke*, of 22, Caroline-street, Birmingham, for a saveall, or candle-spring.
13. *James Horne*, of Clapham Common, for a pencil-case.
16. *William Wilson*, of King-street, Manchester, for a shower bath.
16. *William Llewellyn*, of 7, John-street, Bristol, for a metal template.

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Sep. 19. *John Chapman*, of 81, York-place, Waterloo-road, for a thong for whips.

20. *Samuel Childs*, of 11, Green-street, Leicester-square, for a wax night light, or mortar.

20. *John Hutchings*, of Bath, for a boot or shoe sole.

25. *Alexander Horatio Simpson*, of St. Margaret's, Westminster, for a pneumatic life-preserver.

List of Patents

Granted by the French Government from the 1st of January to the 31st of March, 1841.

(Continued from Page 151, Vol. XXIII.)

PATENTS FOR TEN YEARS.

Palade, represented in Paris by M. Perpigna, advocate, for spinning cards.

Nillus, represented in Paris by M. Perpigna, advocate, for improvements in mills for grinding sugar canes.

Haurist and Janniard Grangey, of Nuits, represented by M. Perpigna, advocate, for improvements in presses.

Guyon Brothers, of Dôle, represented in Paris by M. Perpigna, advocate, for an improved stove.

Dupuy, Pinel, and Oulonne, represented by M. Perpigna, advocate, for improvements in candle making.

Davies, of Manchester, represented by M. Perpigna, advocate, for a new regulator.

Bonnefin and Tiget, of Nantes, represented in Paris by M. Perpigna, advocate, for the making of mosaic in bitumen.

Amy, of Brignolles, for a process for extracting the hairs from skins without using lime.

Benoit, of Montpellier, for an improved scouring machine.

Blaise, of Signy-le-Petit, for an improved oven.

Browne, of London, for the means of preserving colours for painting and other fluids.

Cazenave, of Bordeaux, for surgical instruments in gelatine.

Champavère, of Paris, for a new button.

Corvillion, of Cognac, for an economical inlaid floor.

Deminuid, of Connueau, for improvements in making horse-shoes.

Depay, of Palsonnes, for a machine for making plush.

Dervoise, for a process for ornamenting skins of all kinds.

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Dufossée, of Paris, for a method of substituting gum to Indian-rubber, for elastic purposes.
Dumonthier, of Houdan, for a new mill.
Ewbank, of London, for an improved steam-engine.
Finibel, of Paris, for a machine for making carriage-springs.
Gray, of London, for a new motive force.
Henry, of Paris, for an apparatus for calculating.
Jeaumaire, of Caen, for an improved steam-engine.
Jourdan Brothers, and Savournin, of Paris, for improvements in the making of sugar from potato starch.
Ketenhovent, of Paris, for an improved mode of fastenings for doors.
Kippon, of London, for improvements in clocks, &c.
Knapp, of London, for improvements in moor heads.
Kollet and Angois, of Marchiennes, for a copying machine.
Landry, of Paris, for an improved embrocation.
Laroche Brothers and Co., of Puymoyen, for improvements in the manufacturing of paper.
Liébermann, of Paris, for improvements in shoes and boots.
Marie, of Caen, for a new method of making gas.
Meltzer, for an improved method of heating by steam.
Modo and Sery, of Paris, for shoes and trouser-straps, in Indian-rubber.
Montgolfier and Seguin, of London, for an improved method of employing iron.
Morellon and Ollivier, of Belleville, for boxes for chemical matches.
Morris, of London, for a method of making lime.
Paing, of Bayonne, for a machine for making nails, screws, &c.
Poole, of London, for improvements in the manufacturing of carbonate of lead.
Puissant, of Brussels, for an improved pump.
Roe, of London, for a new method of cleaning guts.
Sanford and Parall, for a machine for making paper.
Schodet, of Lille, for improvements in hearths.
Sulzberger, of Paris, for the employment of heat generally lost in the working of metals.
Tourny, Labaute, and Jacquot, of Nancy, for a process for obtaining blue dye.
Perstraeten, of Lille, for the manufacturing of felt cloth.
Webster Cochran, of New York, for improvements in cannons.

PATENTS FOR FIVE YEARS.

Debette Wissocq, of Calais, represented in Paris by M. Perpigna, advocate, for bobbin net frames.

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Derousseaux, of Lille, represented by M. Perpigna, advocate, for an economical stove.

Determes, of Bergerac, represented in Paris by M. Perpigna, advocate, for a new syringe.

Durand Brothers, represented in Paris by M. Perpigna, advocate, for improvements in the manufacture of silks.

Favre, represented in Paris by M. Perpigna, advocate, for improvements in the dyeing of silk.

Fredière and Guyon, of Lyons, represented by M. Perpigna, advocate, for a new soap.

Gillet, represented by M. Perpigna, advocate, for a new apparatus for making ices.

Grivel, represented by M. Perpigna, advocate, for a batten for weaving ribbons and silks.

Heritaux Froideval, represented by M. Perpigna, advocate, for a new motive power, to be used as a substitute for steam.

Lelong, represented in Paris by M. Perpigna, advocate, for an apparatus for extracting fat from bones.

Marmin, of Paris, represented by M. Perpigna, advocate, for a new varnish of Indian-rubber.

Morel Ancelot, represented by M. Perpigna, advocate, for a new pump.

Rostan, represented by M. Perpigna, advocate, for an economical method of burning lime.

Sorbé, of Nantes, represented by M. Perpigna, advocate, for an improved thrashing machine.

Archard and Co., of Draguignan, for a machine for spinning silk.

D'Alviset, Baron de Maisières, and Boulet, of Urzy, for an atmospheric machine.

Andrieu, of Vigny, for perpetual motion, obtained from stagnant water.

Bardot, of Lyons, for a gas apparatus.

Basset, of Montmeyan, for improved stays for deviations of the spine.

Basset Brothers, of Mans, for improved slides for umbrellas and parasols.

Baysset, of Sauvetat, for a process for improving wines.

Benard, of Vaugirard, for an improved cooking apparatus.

Boussage, of Paris, for improved metallic heels, with or without spurs.

Canning, of Paris, for improvements in pumps.

Carrière, of Carlsruche, for improvements in type.

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Chatelain, of Paris, for a new kind of razor.
Charpentier and Bailly, of Paris, for an improved lamp.
Clement, of Orleans, for a machine applicable to the weaving of woollen cloths, of all widths and all qualities.
Coignet, of Lyons, for improvements in the making of phosphorus.
Combet, of Nimes, for improvements in making shawls.
Deffry, of Bourgogne, for an improved batten.
Dekemel, of Cire-les-Melle, for a new pen-holder.
Delegue, of Lyons, for a machine for preparing dyed silk-threads.
Denau, of Lyons, for an improved stove.
Deslandes, of Paris, for a machine for making glass paper.
Deville, of Besançon, for an improved pen.
Dunant-Narat, of Paris, for a new process of engraving.
Duport, of Paris, for a new process of enlarging, incrusting, sculpturing, and gilding.
Esdaile and Margrave, of London, for an improved machine for making matches.
Ferdinand, of Paris, for improvements in buckles.
Fournier and Pontremoli, of Paris, for a method of changing the knot of a cravat.
Freeman, of London, for a process for manufacturing paving-stones from a new substance.
Gache, of Lyons, for improvements in mills for preparing warp-threads.
Germain, of Mans, for new reins.
Grassal, of Paris, for a vase for containing gaseous liquids.

List of Patents

Granted for SCOTLAND, subsequent to August 22nd, 1843.

To John Wood, of Parkfield, Birkenhead, Cheshire, merchant, for certain improvements in machinery or apparatus for affording additional or artificial buoyancy to sea-going and other vessels, or for lessening their draught of water; and which said improvements are also applicable to raising vessels or other heavy bodies, and for securing or supporting the same.—Sealed 23rd August.

William Wylam, of Newcastle-upon-Tyne, merchant, for an artificial composition, which, variously modified, may be applied in preparing fuel from coal and other substances; or as a ce-

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ment; or as a substitute for stone; or as a coating for metals and other substances,—being a foreign communication.—Sealed 28th August.

James Greenshields, of Monteith-row, Glasgow, Gent., for improvements in the manufacture of compositions for covering roads, streets, and other ways and surfaces, and in rendering fabrics waterproof; to be used for covering buildings, bales, packages, and for other useful purposes.—Sealed 31st August.

Claude Edward Deutsche, of Fricourt's Hotel, St. Martin's-lane, London, for improvements in combining materials to be used for cementing purposes, and for preventing the passage of fluids, and also for forming or constructing articles from such composition of materials,—being a foreign communication.—Sealed 31st August.

William Wilson, John Studholme Brownrigg, John Cockerell, and Sir George Gerard de Hochepied Larpent, Baronet, all of Belmont, in the Wandsworth-road, Lambeth, patent cocoa-nut candle and oil manufacturers, and cocoa-nut oil merchants, the assignees of James Soames, Jun., of Wheeler-street, Spitalfields, London, soap-maker, for an extension of three years, from 17th December next, of a patent granted to the said James Soames, Jun., for a new preparation or manufacture of a certain material produced from a vegetable substance, and the application thereof to the purposes of affording light, and other uses.—Sealed 31st August.

Alexander Spears, of Glasgow, merchant, for improvements on, or appertaining to, glass bottles, proper for wines and other liquids,—being a foreign communication.—Sealed 7th September.

Frederick Steiner, of Hyndburn Cottage, near Accrington, Lancashire, Turkey-red dyer, for a new manufacture of certain coloring matter, commonly called garancine,—being a foreign communication.—Sealed 7th September.

William Kenworthy, of Blackburn, cotton-spinner, for certain improvements in machinery or apparatus, called beaming or warping machines.—Sealed 13th September.

Lemuel Wellman Wright, of Wrexham, Denbighshire, engineer, for certain improvements in machinery or apparatus for bleaching various fibrous substances; and is in possession of improvements in machinery or apparatus for converting or manufacturing the same into paper,—being partly his own invention and partly a foreign communication.—Sealed 20th September.

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New Patents
SEALED IN ENGLAND.
1843.

To Charles Louis Felix Franchot, of Arundel-street, Middlesex, civil engineer, and Cyprien Marie Tessie du Motay, of Arundel-street aforesaid, Gent., for an improved method of connecting and laying pipes or vessels beneath the surface of water, for the purpose of forming therewith tunnels or viaducts, for the conveyance of passengers and goods. Sealed 31st August—6 months for inrolment.

George Catlin, of Queen-square, Bloomsbury, artist, for certain improvements in the construction of vessels for navigation, designed to prevent the loss of life in cases of shipwreck, or other accidents at sea. Sealed 4th September—6 months for inrolment.

William Thomas, of Cheapside, merchant, for an improved fastening for wearing apparel, and which may also be applied as a fastening to portmanteaus, bags, boxes, books, and other things, —being a communication. Sealed 6th September—6 months for inrolment.

Alexander Spears, of Glasgow, merchant, for improvements on, or appertaining to, glass bottles, proper for wines and other liquids,—being a communication. Sealed 6th September—6 months for inrolment.

Pierre Pelletan, of Fitzroy-square, Middlesex, Esq., for improvements in the production of light. Sealed 6th September—6 months for inrolment.

William Denley, of Hans-place, Sloane-street, bricklayer, for certain improvements in the construction of fire-places, flues, and chimnies. Sealed 21st September—6 months for inrolment.

John Baptist Wickes, of Leicester, frame-work knitter, for improvements in machinery employed in the manufacture of frame-work knitted and looped fabrics. Sealed 21st September—6 months for inrolment.

George Robert D'Harcourt, of Argyle-street, Middlesex, Gent., for improvements in sorting, checking, and delivering letters, newspapers, and other articles. Sealed 28th September—6 months for inrolment.

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CELESTIAL PHENOMENA FOR OCTOBER, 1843.

D.	H.	M.	
1			Clock after the sun, 10m. 11s.
	—		☽ rises 2h. 39m. A.
	—		☽ passes mer. 6h. 56m. A.
	—		☽ sets 11h. 21m. A.
	—		Occul *f* in Sagittarii, im. 7h. 24m. em. 8h. 40m.
	—		Occul 57 Sagittarii, im. 11h. 7m. em. 11h. 54m.
	1	30	♄ in conj. with the ☽ diff. of dec. 2. 5. S.
	5	47	♃'s third satt. will im.
	19	19	♃'s third satt. will em.
2	4	15	☿ in sup. conj. with the ☉
3	6	24	☿ stationary
	9	6	☿ in conj. with Ceres, diff. of dec. 6. 38. N.
	10	13	♃ in conj. with the ☽ diff. of dec. 5. 24. S.
4	21	10	♂ in □ with the ☉
5			Clock after the sun, 11m. 25s.
	—		☽ rises 4h. 5m. A.
	—		☽ passes mer. 9h. 57m. A.
	—		☽ sets 2h. 55m. M.
	12	35	♃'s first satt. will em.
6			Occul *m* Piscium, im. 10h. 25m. em. 11h. 30m.
6	5	46	♃'s third satt. will em.
6	22	40	♅ in conj. with the ☽ diff. of dec. 6. 17. S.
7	7	4	♃'s first satt. will em.
8	7	13	♃'s second satt. will em.
8	11	16	Ecliptic oppo. or ○ full moon
8	22	55	☿ in conj. with Vesta, diff. of dec. 8. 25. S.
9	4		☽ in Apogee
10			Clock after the sun, 12m. 50s.
	—		☽ rises 5h. 39m. A.
	—		☽ passes mer. 0h. 46m. M.
	—		☽ sets 8h. 30m. M.
12			Occul *r* in Tauri, im. 15h. 9m. em. 16h. 6m.
13		8	♄ in □ with the ☉
	7	18	♂ in Perihelion
	10	9	☿ in conj. with ♀ diff. of dec. 3. 21. S.
14	3		♃ stationary
	9	0	♃'s first satt. will em.
15			Clock after the sun, 14m. 4s.
	—		☽ rises 9h. 31m. A.
	—		☽ passes mer. 4h. 50m. M.
	—		☽ sets 1h. 5m. A.
	7	6	☿ in inf. conj. with the ☉
	9	49	♃'s second satt. will em.
16			Mercury R. A. 13h. 15m. dec. 9. 19. S.
	—		Venus R. A. 13h. 38m. dec. 9. 8. S.
	—		Mars R. A. 19h. 23m. dec. 24. 30. S.
	—		Vesta R. A. 13h. 55m. dec. 6. 51. S.
16			Juno R. A. 21h. 7m. dec. 12. 36. S.
	—		Pallas R. A. 12h. 46m. dec. 1. 26. N.
	—		Ceres R. A. 13h. 1m. dec. 1. 26. N.
	—		Jupiter R. A. 21h 21m. dec. 16. 36. S.
	—		Saturn R. A. 19h. 24m. dec. 22. 9. S.
	—		Georg. R. A. 23h. 59m. dec. 0. 55. S.
	—		Mercury passes mer. 23h. 30m.
	—		Venus passes mer. 0h. 1m.
	—		Mars passes mer. 5h. 45m.
	—		Jupiter passes mer. 7h. 43m.
	—		Saturn passes mer. 5h. 46m.
	—		Georg. passes mer. 10h. 20m.
	1	59	☽ in □ or last quarter
	17	13	♂ in conj. with ♄ diff. of dec. 2. 16. S.
18	20	6	☿ in conj. with Ceres, diff. of dec. 8. 9. S.
19			Occul *u* Leonis, im. 15h. 56m. em. 16h. 34m.
19	14		☿ in the ascending node
20			Occul *B* Virginus, im. 16h. 29m. em. 17h. 4m.
20			Clock after the sun, 15m. 3s.
	—		☽ rises 2h. 39m. M.
	—		☽ passes mer. 9h. 4m. M.
	—		☽ sets 3h. 12m. A.
22	1	44	☿ in conj. with the ☽ diff. of dec. 5. 53. N.
22	6	52	☿ in conj. with Vesta, diff. of dec. 4. 2. N.
	9	46	☿ in conj. with Pallas, diff. of dec. 6. 19. S.
	20		☽ in Perigee
23	7	20	☿ in conj. with the ☽ diff. of dec. 4. 49. N.
		36	Ecliptic conj. or ● new moon
	17	49	☿ stationary
24	3	28	☿ in Perihelion
25			Occul *o* Scorpii, im. 4h. 43m. em. 5h. 49m.
25			Clock after the sun, 15m. 46s.
	—		☽ rises 9h. 49m. M.
	—		☽ passes mer. 1h. 51m. A.
	—		☽ sets 5h. 49m. A.
28	10	14	♄ in conj. with the ☽ diff of dec. 2. 27. S.
29	1	10	♂ in conj. with the ☽ diff. of dec. 5. 58. S.
30	2	43	☽ in □ or first quarter
30	12		Vesta in conj. with the ☉
	16	52	♃ in conj. with the ☽ diff. of dec. 5. 36. S.
	22	35	☿ greatest elong. 18. 35. W.
31	13	5	☿ in conj. with Pallas, diff. of dec. 6. 4. S.

J. LEWTHWAITE, Rotherhithe.

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THE

London

JOURNAL AND REPERTORY

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Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXLIII.

Recent Patents.

To THOMAS EDGE, *of Great Peter-street, in the City of Westminster, gas apparatus manufacturer, for certain improvements in apparatus for measuring gas, water, and other fluids.*—[Sealed 9th May, 1842.]

THIS invention of certain improvements in apparatus for measuring gas, water, and other fluids, consists, Firstly,—in improvements upon the ordinary water gas-meter; by means of which a more correct registration of the quantity of gas passed is obtained, and the action of the meter is stopped with greater certainty when the water has sunk, by evaporation, or other causes, below a certain level. Secondly,—improvements in constructing a station meter for gas works; whereby the total quantity of gas issuing from the gasometer, and consumed by the public, within any given time, may be ascertained, and its pressure regulated. Thirdly,—in a novel construction or arrangement of parts constituting a meter for measuring water or other fluids; and Lastly,—an improved method of constructing the counting apparatus of meters; whereby the quantity of gas or other fluid that passes through the compartments may be more easily ascertained; which

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last improvement may be applied to any machine or apparatus intended for measuring fluids.

In the meters now in use, the action is arrested, when the water is too low, by closing the valve through which the gas enters; but owing to the peculiar construction and arrangement of the parts connected with this valve, they are liable to become corroded, and thereby prevent the valve from closing when the meter is deficient of water, and, consequently, the meter will register incorrectly. Now, the object of the first of these improvements is to remove this evil, and cause the valve to close as the level of the water in the meter sinks.

Figs. 1, and 2, in Plate X., represent two views of an ordinary water gas-meter, with the first part of the improvements applied thereto. Fig. 1, is a front view of a meter, seen partly in section, to shew more clearly the internal arrangement; and fig. 2, is a horizontal view of the same, partly in section. *a*, *a*, is the outer casing, enclosing the wheel or drum, partly immersed in water, as usual; *b*, is the pipe for admitting gas into the meter; and, in order to enter the drum, the gas must pass through the valve *c*. When the meter is properly supplied with water, this valve is always kept open by a small rod, affixed to the upper part of the ball or spherical float *d*; which float rises and falls as the level of the water varies. The rod on the top of the ball *d*, supports the lid of the valve, at the end of a small lever *e*, which has its fulcrum at *f*; and as the level of the water descends, from evaporation, or other causes, the ball *d*, descends with it, and allows the end of the lever *e*, to fall down and close the valve, as seen in fig. 1. A shield or guard *g*, formed of tin plate, is placed above the valve *c*, and lever *e*, to prevent any sudden flow of gas down the pipe *b*, operating to close the valve, and also to prevent deposition upon the valve of any extraneous matter. At the bottom of the float *d*, a small weight *d**, is attached, for the purpose of keeping the rod on the top of the float erect, and preventing the lid of the valve tilting or resting on one side of the raised rim or valve-seat; or, instead of this weight, the lower part of the float may be rendered thick, or otherwise weighted within, which will effect the same object.

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Another improvement proposed to be made upon the ordinary meter, is to surround the pipe *h*, (through which water is poured into the meter) with a vertical casing or box, as at *i*, *i*. The upper edges of this box should be on a level with the water, and thus form a syphon; so that any pressure which may be produced in the water, will never be able to expel the water therefrom, through either the charging or side plugs.

Fig. 3, represents a mode of compensating for either an increase or decrease in the quantity of water contained in a gas-meter. *a*, is the frustrum of a cone, fixed upon the vertical spindle turned by the ordinary worm-shaft; *b*, is a similar frustrum of a cone, inverted, and affixed to the spindle of the counting machine; *c*, is a band, embracing these two cones, which is raised and lowered by a guide *d*, connected to the lever on which the float *e*, is fixed. Hence, as the float rises and falls, the band is passed higher or lower on the peripheries of the cones, so as to operate upon the larger diameter of the one cone, and the smaller diameter of the other. If it be supposed that the registration of a meter would vary ten per cent. by the increase or decrease of one inch in the level of the water, then the larger and smaller extremities of the frustrums should vary about one-twentieth in diameter, and, consequently, (the cones being properly adjusted) the different situations of the band would communicate from the cone *a*, to the cone *b*, and thence to the counting machine, such rotary motion as will indicate the quantity of gas passed through the chambers of the meter.

The improved station meters, of which there may be several arrangements or modifications, are shewn in the following figures of the drawing:—Fig. 4, represents an external elevation of a tank and gas-holder, with the registering apparatus attached thereto. Fig. 5, is a vertical section of the same. *a*, *a*, *a*, is the tank; *b*, *b*, *b*, the gas-holder; *c*, the vertical pipe, by which the gas is introduced into the gas-holder; and *d*, the pipe for leading the gas off to the mains, and thence to the burners. The upper end of the tube *c*, has a contracted aperture *e*, *e*, in which a parabolic cone *f*, is

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suspended, acting as a valve, its apex being attached at *g*, to the interior of the gas-holder; consequently, by the ascent and descent of the gas-holder, the cone *f*, is made more or less to close or open the aperture *e*, for the ingress of the gas into the holder. To the outside of the gas-holder a vertical rod *h*, is affixed, having a rack on its edge, taking into the teeth of a wheel *i*, the axle of which turns upon bearings on a stationary bridge *k*, *k*; and the ascent of this rod is guided by a friction-wheel. Upon a square at the end of the axle of the wheel *i*, an arm or lever *l*, is affixed, carrying an adjustable weight *m*; which lever and weight is raised by the turning of the wheel *i*, as shewn by the dots in fig. 5. The bridge *k*, *k*, has also a bracket standard *n*, supporting a going-clock *p*, from whence a vertical spindle *q*, descends, which is carried round once in twelve hours by wheel-work within the clock. Upon this spindle is fixed a drum *r*, intended to be covered with a sheet of white paper, graduated vertically round its periphery into twelve compartments, answering to the twelve hours of the night; and also into horizontal compartments, corresponding to the altitude of the gas-holder. The upper end of the rod *h*, carries a pencil *s*, the point of which is in contact with the periphery of the drum *r*; and, hence, as the gas-holder rises or falls, the point of the pencil marks its altitude, and the rotation of the drum shews the time and the extent of opening of the aperture or valve *e*, *e*; and, consequently, the quantity of gas which has passed at any time during its action, as previously ascertained and known by experiment. If the burners are all closed, so as to prevent any passage of gas through the pipe *d*, then the gas, in rising through the valve *e*, will raise the holder to its highest elevation, and draw up the cone, so as to close the valve; at which time the weighted lever or arm will be raised nearly into a vertical position, and give its least amount of pressure upon the holder. But when the jets are opened, and the gas is passing off through the pipe *d*, the holder and cone will descend, and allow so much gas to pass as may be required for the consumption of the jets; the weighted arm falling at the same time, and, consequently, increasing the pressure as it

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approaches a horizontal position, and thereby affording a compensating pressure, according to the passage and friction of the gas through the mains.

Two slight modifications of the compensating pressure-lever are shewn in the specification, which will be unnecessary here to describe.

Figs. 6, 7, 8, and 9, represent modifications of station gas-meters, in which the quantity of gas passed through them is ascertained by the measurement of a fractional part of the volume of gas only, and whereby the whole quantity may be inferred. Figs. 6, and 7, are sections of a station gas-meter, taken vertically at right angles to each other. *a*, *a*, is a cylindrical tank, containing water; *b*, *b*, is a gas-holder, working within, having an air-chamber *c*, *c*, at its bottom, to give the gas-holder buoyancy. A central tube *d*, has a small pipe *e*, in its bottom, communicating with the inlet gas-pipe *f*, and its chamber *g*. A vertical rod *h*, *h*, attached to the gas-holder, passes between guide pullies, carrying a parabolic cone *i*, at its upper end, which cone, as a valve, fits into the seat or aperture communicating between the chamber *g*, and the upper part of the tank *a*, *a*. Another vertical rod *k*, attached to the gas-holder, (shewn at fig. 7,) carries a smaller parabolic cone *l*, at its upper end, which acts as a valve in an auxiliary chamber *m*, placed by the side of the chamber *g*. An ordinary gas-meter *n*, of small dimensions, is placed at the upper part of the apparatus, having an inlet-tube from the chamber *g*, for conducting a small quantity of gas into this little meter; from which, when measured, it is discharged through an aperture into the auxiliary chamber *m*. The gas-holder *b*, *b*, is weighted equal to about two-tenths of a column of water, and, therefore, when the pressure is the same, both above and below the gas-holder, it will bring down the cones *i*, and *l*, and close the communications. If then the pressure of the gas in the tank *a*, *a*, be diminished, by the required discharge through the pipe *p*, to the main and burners, the passage of the small quantity of gas admitted through the pipe *e*, to the interior of the holder *b*, will cause the holder to rise, and thereby open the valves *i*, and *l*, and allow the

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equivalent quantity of gas to pass through them to the tank *a, a.* As the cone-valves *i,* and *l,* bear a certain relation to each other in all their parts, (the former being so many times larger than the latter) the passage of the gas through the small meter *n,* from the chamber *g,* to the chamber *m,* and thence to the tank, will always measure a proportional quantity of gas, and thereby indicate, by inference, the whole quantity passed through the valve *i.*

Figs. 8, and 9, exhibit another modification of a station meter, of a cylindrical form; fig. 8, being an elevation, in which a part of the tank is shewn in section; and fig. 9, a horizontal section through the lower part. *a, a,* is the tank or external casing; *b, b,* is a circular partition, between which and the outer casing the space is occupied with mercury. The gas-holder *c,* descends into this mercurial chamber, which forms an air-tight valve. On the side of the gas-holder there is a smaller chamber *d,* intended to receive a small current of gas through the pipe *e,* leading from a small gas-meter. The pressure of the gas introduced into the gas-holder by the pipe *f,* raising it, as in the former instance, the large volume of gas will be discharged into the tank at the large aperture *g,* whilst the lesser quantity of gas from the small meter, bearing its relative proportion, will pass to the tank through the narrow slit *h,* and thereby indicate, as before, the amount of the whole. Fig. 10, represents an improved apparatus for indicating gas-pressure. *a,* may be supposed to be part of a gas-main; *b,* is a pipe, inserted into the main, which conducts the gas into a chamber, shewn in section at *c*,* figs. 6, and 7. The lower part of this chamber is occupied with water, colored red, to render it more evident; and into the chamber is inserted, and passed down into the water, the open end of a vertical glass tube *d.* According to the pressure of the gas in the main, (thus enabled to act upon the surface of the water in the chamber *c**) so will the colored water be raised in the glass tube to an altitude equivalent to the difference of their respective diameters; that is, if the area of the water in the chamber *c*,* be ten inches, and that of the tube one inch, any pressure, acting upon its sur-

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face, will raise the colored water in the glass tube *d*, nine times that of its depression in the chamber,—the graduated scale upon the glass shewing the absolute pressure.

The improved apparatus for measuring water or other liquids, is represented at figs. 11, 12, and 13; it is of a rectangular form, made of flat iron plates, bolted or rivetted together. Fig. 11, is a longitudinal section, taken vertically through the apparatus; fig. 12, is a horizontal section; and fig. 13, a vertical section, taken through the chamber A, of fig. 11, looking towards the right-hand. Within the rectangular vessel *a*, *a*, there is a partition *b*, crossing it in the middle, which divides the vessel into two compartments A, and B, leaving a narrow slit or opening at the top of the partition *b*, to afford a free communication of air between the two chambers. The water is admitted into the vessel by a vertical pipe *c*, leading into a passage *d*, as shewn by dots in fig. 12. The inner extremity of this passage communicates with a slit 1, in the valve-box *e*. The valve *f*, is of a fan-shape, sliding horizontally over the valve-box, and is hollowed within like the D-valve of a steam-engine, so as to communicate with two of the slits in the valve-box, into whichever position it may be slidden. A spherical float *g*, is attached by an arm to a horizontal spindle *h*, the pivots of which turn in stationary bearings. To a square on this horizontal spindle *h*, an arm or lever *i*, with a spade-formed end, is affixed, which, as the float rises and falls, by the elevation or depression of the water in the chamber A, is made to vibrate, and to act against teeth or pins on the side of a tumbler *k*. Supposing the chamber A, to be occupied with liquor, the float *g*, will necessarily have risen to its highest position, and, consequently, have forced the lever *i*, into the situation shewn in fig. 13,—having thrown the tumbler *k*, over, by its action against the tooth 1, as represented. One of the claws of the under side of the tumbler will, by this movement, have pushed the sliding valve *f*, sideways; opening the slit 3, in the valve-box, and thereby allowing the liquor to pass to the discharge-pipe *l*. This situation of the valve will allow the liquor, from the passage *e*, to flow from the slit 1, through the hollow valve into the slit 2, and thence by a central passage, shewn

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by dots in fig. 12, into the compartment B; in which compartment, as the liquor rises, the air will become compressed, and, passing through the slit at top into the compartment A, will assist in discharging the liquor therefrom. As the liquor sinks in the chamber A, the float *g*, will fall; and when it has so done, will force the lever *i*, into the situation shewn by dots in fig. 13; throwing the tumbler and valve into the reverse positions, which will open the slit 1, to conduct the liquor from the passage *e*, to the chamber A, and form the communication from the chamber B, to the discharge-pipe *l*, through the slits 2, and 3. Attached to the horizontal spindle *h*, is a click *m*, working into a crown-wheel *n*, connected with the counting apparatus in the box *p*; (see fig. 11,) hence, by the rising and falling of the float, the number of times that the vessels A, and B, have been filled with liquor, will be registered. To prevent any inconvenience which might arise from the escape or absorption of air from the vessel, a float *q*, in the chamber B, is connected by a lever *r*, to a valve *s*, in the pipe *c*, which, in the event of the liquor rising too high, will close the supply-pipe; and, if such should be the case, a two-way cock *t*, may be turned, to stop the inlet, and let off the liquor from the chamber B.

In order to measure the quantity of water passed into a steam-boiler, the contrivance shewn at fig. 14, is adopted. *a*, being the boiler; *b*, an Archimedean measuring-wheel, through which the water is passed to the boiler; *c*, is a pipe, by which steam from the boiler is conveyed into the box, for the purpose of giving the same pressure therein as exists in the boiler. The steam-pipe *c*, in this contrivance, is the only feature to which any claim of novelty is made.

The fourth and last part of the invention, namely, improvements in the counting machines for meters, is shewn under the following figures:—The improvement consists in a novel or improved construction of this part of a meter, whereby the indicating or registering apparatus is much simplified, and toothed gearing in a great measure dispensed with. The index-box, containing the apparatus, may be placed in the same situation on the meter as in ordinary water gas-meters, as seen at fig. 1. Figs. 15, 16, and 17, represent different views

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of one description of registering apparatus. Fig. 15, is the index-box, with the face-plate removed, to shew the dials; fig. 16, is a section, taken through the apparatus, just behind the dials; and fig. 17, a horizontal view of the apparatus. The upright shaft *k*, receives motion from the drum within, by means of a worm *l*, on its axle, seen in figs. 1, and 2. This worm *l*, gears into a horizontal toothed-wheel *m*, at the lower end of the shaft *k*. The rotary motion thus obtained is communicated to the registering apparatus by means of a worm *n*, (shewn in fig. 16,) on the upper end of the shaft *k*, which gears into the wheel or pinion *o*, and causes it to rotate in the direction of the arrow. On the same shaft as the pinion *o*, a peculiarly shaped snail or cam *p*, is mounted, against the periphery of which one end of a long lever *q*, bears. This lever vibrates on a centre, and is kept in contact with the snail or cam *p*, by means of the spring *r*; it is also furnished with a pall or click *s*, which falls into the notches or teeth of the ratchet-wheel *t*. The action of the registering apparatus is as follows:—As the cam *p*, on the shaft of the pinion *o*, revolves in the direction of the arrow, it gradually raises the end of the lever *q*, into the position shewn by dots in fig. 16; thereby drawing the pall or click *s*, out of the notch or tooth of the wheel *t*, and allowing it to drop into the notch above. Then, immediately that the longest radius of the cam has passed the extreme end of the lever *q*, this lever is made to descend, and, by means of the pall or click, it forces the ratchet-wheel *t*, round the distance of one notch or tooth; but, in order that the force of the blow may not turn the wheel more than one notch, the pall or click comes into contact with the banking-piece *u*, which prevents the wheel from turning any further, until the pall or click is again released.

It must now be understood, that one hundred feet of gas pass through the meter for every revolution of the pinion *o*, and cam *p*; and that every rotation of the said cam makes the wheel *t*, move forward one tooth; therefore, the numbers marked on the dial *o**, which is in connection with the pinion *o*, indicate tens; and those on the dial *t**, which is on the same shaft as the wheel *t*, will indicate that one hundred feet of gas have passed through the meter. This quantity is regis-

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tered by the ratchet-wheel *w*, by a small pin or stud *v*, on the wheel *t*, acting against one of the teeth of the ratchet-wheel *w*, and turning it round on its axis one notch. As there is only one pin or stud *v*, on the wheel *t*, this wheel must make a complete rotation before it can act against the next tooth of the wheel *w*; and as there are ten teeth on the wheel *t*, and each tooth corresponds to one hundred feet of gas consumed, as above-mentioned, so each tooth or notch of the wheel *w*, will correspond to one thousand feet. Another pin or stud *x*, similar to *v*, is affixed to the wheel *t*, and acts upon the teeth of the ratchet-wheel *y*, in the same way as *v*, acts upon the teeth of the wheel *w*. Each of the wheels *t*, *w*, and *y*, has ten teeth or notches; and upon the wheel *t*, making a complete revolution, (thereby indicating that one thousand feet have passed through the meter,) this quantity will be registered on the dial *w**, of the wheel *w*, by turning the said wheel round one tooth; and when this wheel shall have accomplished one revolution, it will turn the wheel *y*, round one tooth, and thereby indicate on the dial *y**, that ten thousand feet have passed through the meter. The wheels *t*, *w*, *y*, and their corresponding dials, only move periodically; that is to say, when a quantity, corresponding to their numbers, has passed through the meter: for example, the wheel *t*, moves one notch at every hundred feet; the wheel *w*, one notch at every thousand; and the wheel *y*, one notch at every ten thousand. *z*, *z*, *z*, are palls, acted upon by springs, for the purpose of keeping the wheels in their positions, when not acted upon by the click *s*.

Fig. 18, represents another arrangement of wheels, in which the axles of three wheels *a*, *b*, and *c*, carry the dial-plates; and a sliding catch-bar *d*, *d*, moved by an excentric *e*, on the vertical spindle, drives them round in the following way:—The wheel *a*, has nine shallow teeth, and one deep tooth, and every time that the catch-bar is slidden forward by the excentric, the first click takes a tooth of the wheel *a*, until the deep tooth arrives under the click; by which, the catch-bar is allowed to fall far enough to enable the second click to take a tooth of the wheel *b*, which, by the snail, is made to advance, and drive the wheel *b*, one tooth, thereby registering

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ten rotations of the wheel *a*. The wheel *b*, is in like manner formed with nine shallow teeth, and one deep tooth, allowing the third click, in the same way, to act upon the wheel *c*, after every rotation of *b*.—[*Inrolled in the Petty Bag Office, November*, 1842.]

Specification drawn by Messrs. Newton and Son.

To CHARLES CLARK, *of No.* 1, *Great Winchester Street, in the city of London, merchant, for his invention of an improved pyro-hydro-pneumatic apparatus, or means of generating, purifying, and condensing steam and other vapours, and of extracting from vegetable substances, the soluble portions thereof; as also, the application of parts of the said apparatus to other heating, evaporating, and distilling purposes.*—[Sealed 31st January, 1843.]

THIS improved apparatus is shewn at fig. 1, in Plate XI., as applicable to converting sea-water, or any other water holding saline and other solid matters in solution, into fresh water. A, is the supply cistern, which communicates by a pipe *a*, with a self-regulating induction apparatus B, on what is known as "Hamer's plan." C, is a strong wrought-iron cylinder, fitted at bottom into a flanged ring-plate *c*, and covered with a conical top; it is about two-thirds filled with the water to be operated upon. D, is a cylindrical furnace, concentric with the water cylinder C; *d*, is an upward air and water-tight tube, which serves both as a feed-pipe, through which the fuel is supplied to the furnace, and as a passage for the escape of the smoke and other gaseous products of combustion; *e*, is a hinged trap-door, through which the fuel is passed into the tube *d*; *h*, is a chimney, in which the pipe *d*, terminates; and *i*, a damper, by which the degree of activity given to the furnace can be regulated at pleasure; *f*, is an open air-pipe, which leads from the outside, through the boiler, into the furnace, a little way above the fire-bars, and assists in securing a good draft through the furnace to the chimney. To the water cylinder C, there are attached gauge-cocks *g*, *g*, for ascertaining, from time to time, the heighth of the water; *l*, is a cock or tap, for drawing off the brine and

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other residual matters, which collect at the bottom of the boiler; *m*, is a screw-cap hand-hole, through which access may be had to the interior of the water-cylinder C, when it is required to be cleaned; E, is a short pipe fitted into the conical top of the water-cylinder C, and conveys the steam, generated in that cylinder, into the steam-head or receiver F; G, is a concave plate, resting upon the top of the pipe E, and is a little larger than the pipe, but is kept steady by a weight *k*, of one, two, or more pounds, (as may be found expedient) suspended from it by wires. The purpose of the plate or cap G, is to prevent, in a great measure, if not entirely, any water from escaping into the steam head; (producing the injurious effect commonly called priming) because, until the steam has acquired a pressure exceeding that of the counterweight *k*, it cannot raise the cap G, so as to escape freely into the steam-head F; because any watery particles which may remain still intermixed with it, must, in the interval, or during the rising of the cap G, strike against it, and drop back, either into the water-cylinder C, through the pipe E, or into the space around that pipe at the bottom of the steam-head F; from which latter place, it may be withdrawn by the cock shewn in the drawing;—H, is a pipe, which conveys the steam from the steam-head F, to the rectifier R. The rectifier R, into which the steam passes from the water-cylinder C, consists simply of a cylinder, about one-third the size of the cylinder C, set in a horizontal position. In the lower part of this cylinder a body of water speedily collects, from a partial condensation of the steam, on its first admission; and the water, thus produced, serves afterwards to attract and retain any particles of undecomposed matter, which may come over with the steam, which continues to flow in from the boiler; so that the purer portions, only, of the steam may pass off from the rectifier R, by the pipe N. *n*, is a cock or tap, at the bottom of the cylinder R, for drawing off, occasionally, the water which accumulates therein; R^1, is a second steam rectifier, similar in construction to R, into which the steam passes from the pipe N, and is thereby still further purified.

In some cases, where the quantity of saline and other matters, held in solution, is comparatively small, this second rec-

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tifier may be dispensed with; or, in others, where the water is more than commonly brackish or foul, a third or fourth rectifier, on the same plan, may be added. The condenser, for liquifying the purified steam, and aerating the resulting water, is shewn at t^1, t^2, t^3, and is composed of conical chambers or compartments, placed perpendicularly, and communicating with each other; the chamber t^1, is surrounded by the water in the cistern A, (which becomes partially heated by the steam in the chamber t^1,) and the chambers t^2, and t^3, the two latter of which are exposed to the external air. The lowest chamber t^3, terminates at bottom in a tube *u*, containing, at the mouth of the cone, two or three plates of perforated zinc, through which the external air is admitted. A steam and water-tight perpendicular tube *v*, (of zinc, or other equally pure metal) is inserted at about the middle of the lowest chamber t^3, and continued to the top of the uppermost chamber t^1, and has two lateral branches. The lower end of this tube is closed; but at the top, as also at the ends of the lateral branches, it is open, for the absorption of air by the heat in the tube, and the consequent accelerated escape of the heated air at the top of the tube. W, W, are pipes, which pass externally from about the middle of the chamber t^2, to near the bottom of the chamber t^3, and at the top are of the large size represented in the drawings, but diminish gradually to pipes of a very small diameter at bottom. Of these pipes, there should be as many as can be conveniently applied, in order that the process of condensation may be effectually promoted.

From the second rectifier R^1, the steam is conveyed by a pipe *w*, of gradually enlarged dimensions, to near the top of the middle chamber t^2, whence it diffuses itself throughout the three chambers, and becomes condensed by the various cooling influences to which it is there exposed. The hottest steam of course finds its way into the chamber t^1, where it encounters the greatest amount of heat absorbing means which the apparatus furnishes for the purpose of condensation. The main body of the water, resulting from the condensed steam, either drops directly down to the bottom of the chamber t^3, or runs down the inclined sides of the chambers t^1, t^2, and t^3

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and through the external pipes w, w, and out at the bottom tube, being partially aerated in its course, so far, by the air constantly ascending through the tube *u*.

When an apparatus, constructed as above described, does not give a sufficiently abundant or rapid yield, its efficacy may be increased, by carrying an auxiliary steam-pipe z, z, from the rectifier R^1, round the outside of the water supply-cistern A, and in close contact therewith, for one, two, or more coils, terminating in a cylinder, which communicates, by pipes, with the chambers t^2, and t^3, so that all the water, resulting from the steam condensed therein, may be precipitated through the perforated zinc plates into the general discharge tube *u*. x, is an outer casing of wood or metal, which encloses the condenser,—a small space in width being left all round, and draft-holes *x*, *x*, made in different parts for the admission of air. The refrigerator is made of protected metal, and divided into three compartments y^1, y^2, and y^3. In the top of the compartment y^1, is inserted the end of the discharge-tube *u*; and at a little distance from this tube there are air apertures *a**, *a**, which have shutters on the inside, slanting from the top downwards, to prevent, as much as possible, the escape, outwards, of any vapour which may occasionally be carried down with the water from the condenser. The middle compartment y^2, which is pierced with air-holes all round, is of a convex form at top, and of a concave form (inside) at bottom; so that the water, which drops from the tube *u*, on to the centre of the convex top surface of y^2, falls off towards the sides, through small pipes, which admit the water into the interior of the compartment y^2; while, on the other hand, the concave form (inside) of the bottom of that compartment, causes the water, when it arrives there, to flow towards the centre, where there is a filtering-box *c**, which projects a little way downwards into the lower compartment y^3, placed to receive it. For the purpose of breaking up the water, and thereby the better aerating it, the bottom of the compartment y^2, is covered, about an inch deep, with small pebbles, through which the water percolates towards the filter. The lower compartment y^3, which serves for the final reservoir of the purified and cooled water, is perforated

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with air-holes. c^1, c^1, are small pipes, which serve to promote the continual flow upwards of external air. The compartment y^3, is furnished with a tap, by which the water is drawn off, as required.

For re-distilling or rectifying spirituous liquids, the apparatus is modified in the manner shewn at fig. 2; the supply cistern A, is made much larger, and closed at top, instead of being open; the upper condensing chambers t^1, and t^2, are also enlarged, whilst the lowest one t^3, is narrowed. The second rectifier is removed. The "feints" collect in the bottom of the rectifier B, whence they are drawn off by a cock, while the rectified spirit passes off at top into the condenser. The refrigerator, in this case, is made of two compartments only, and both the filter, and the layer of pebbles in the top of it, are dispensed with. F, is a funnel, with a stop-cock, into which any portion of the spirits may be poured back, to undergo a second distillation and rectification.

The patentee proposes to apply his apparatus to the distillation of worts, as, with the exception of the boiler part, which can be readily detached from the rest, it may be combined with great advantage with common wort stills, for the purpose of contemporary rectification and condensation, as much less cold water will then suffice for these operations than is now ordinarily required. For extracting from vegetable substances the soluble portions thereof, the apparatus is modified in the manner represented at fig. 3. The rectifier B, is fixed in a vertical position, and furnished with a screw-capped hand-hole *f*, through which the vegetable substances are introduced. *g*, is a pipe, through which steam is supplied to the apparatus; and *h*, is a funnel, for pouring back portions of the liquid extract. The rectifier B, is connected by a pipe *k*, to the condenser T. This condenser is made in two portions, which are fitted together by a water-tight joint, so that after each working it may be conveniently cleansed.

The steam which passes from the boiler into the rectifier B, disengages the soluble portion of the vegetable substances, and, if they are volatile, carries them off to the condenser; or, if liquid, combines and falls with them to the bottom of the vessel, whence this portion of the extract is drawn off by the cock or tap, when a fresh charge of matter has to be in-

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troduced. The steam is shut off from the rectifier R, by a cock in the pipe *g*. When the steam is afterwards admitted, to assist the process of maceration, the supply is regulated by the cocks in the pipes *g*, and *k*.

The patentee claims, Firstly, the pyro-hydro-pneumatic apparatus, hereinbefore described, in the general arrangement and combination of parts, and form of condenser, of which the same consists; Secondly, the modifications before described, by which the said apparatus is adapted to the re-distillation or rectification of spirituous liquids, and to the extraction from vegetable substances of the soluble portions thereof; and Thirdly, the application of the condensing and refrigerating portions of the said apparatus, as useful additions to the ordinary wort still, or any other still, and in all cases where the process of aerating the fluid, thus obtained by distillation, is required or useful.—[*Inrolled in the Inrolment Office, July*, 1843.]

Owing to the kindness of Mr. Clark, we have had an opportunity of examining this apparatus while in operation, and we feel great pleasure in recommending it to the attention of our nautical friends, to whom we need scarcely point out the utility of an apparatus of this kind, as most naval men have experienced great trouble, and sometimes incurred considerable expense, in long voyages, to procure fresh water. Mr. Clark's apparatus does not, and is not intended to produce water, in what may be considered very *large* quantities, but it supplies more than sufficient for the use of the ship's company, and that is all that can be desired. We understand that an apparatus, costing £30, and consuming from 1½ to 2 lbs. of fuel per hour, will supply between seventy and eighty gallons of pure water per day.—[Ed.

To Thomas Gore, *of Manchester, in the County of Lancaster, machine-maker, for certain improvements in machinery or apparatus for roving, spinning, and doubling cotton, silk, wool, and other fibrous materials.*—[Sealed 30th March, 1841.]

These improvements consist in the peculiar construction,

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combination, and arrangement of the various parts constituting a spindle and flyer, from which much greater steadiness of all the revolving parts of the spindle apparatus, such as its tube, wharve, and flyer, is attained; and the necessity of a stationary loop-guide or eye, for guiding the threads between the front drawing-roller and the spindle, is removed.

In Plate X., fig. 1, represents a side elevation of the improved spindle and flyer, and fig. 2, a partial sectional view of the same. These figures represent a throstle spindle, and flyer, for spinning or doubling; that for roving being precisely similar in principle and arrangement, but only varied in size and proportion, suitable to its required performance. *a, a,* is a tube, with a wharve *b,* at the top; *c, c,* is a flyer, attached fast to the tube *a,* underneath the wharve *b,*—the whole revolving around the spindle *d, d.* It will be seen that the tube *a, a,* with its wharve and flyer attached, is made to fit the smaller end of the spindle *d,* so as to revolve freely around it, when driven by the band *e, e.*—*f, f,* is the spindle or stud-rail of the throstle-frame, in which the spindle or stud *d, d,* is fixed or secured, by means of the set-screw *g,* or otherwise. The lifting or copping-rail *i, i,* traverses the bobbin *k, k,* up and down the spindle, as usual, as the spinning proceeds; the upper part of the bobbin always remaining on the tube *a, a,* and the lower part upon the spindle or stud *d, d.* The yarn, thread, or roving *l, l,* is delivered, as usual, from the front roller *m, m,* and conveyed through a small opening in the top of the wharve *b,* through a hole in the tube *a,* to the eye of the flyer *c,* and thence proceeds to the bobbin. The wharve, tube, and flyer, being all connected together, are made to revolve rapidly by the band *e, e,* and consequently give the required twist to the yarn. thread, or roving.

The patentee claims the novel and peculiar construction, combination, and arrangement of the parts constituting the spindle and flyer, to be used in machines for roving, spinning, and doubling cotton, silk, wool, and other fibrous substances, as exhibited in the drawing, and above particularly set forth. —[*Inrolled in the Petty Bag Office, September,* 1841.]

Specification drawn by Messrs. Newton and Son.

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To CRAWSHAY BAILEY, *of Nant-y-Glo Iron Works, in the county of Monmouth, Esq., for his invention of certain improved constructions of rails for tramways and railways.*—Sealed 11th January, 1843.]

THESE improved constructions of rails for tramways and railways, consist in a peculiar form given to the iron rails, by which, when placed in parallel lines, in proper seats, on sleepers, they are enabled to answer the double purpose of conducting locomotive and other carriages, having the ordinary kinds of railway wheels, with a flange on one edge, or the ordinary kinds of tram or other waggon wheels, without flanges.

In Plate XI., fig. 1, represents a horizontal view of one of the improved rails A, A, fixed in its seat or chair B, B; fig. 2, represents a vertical section of the same rail, fixed in its seat or chair. It will be perceived that the rail has two surfaces for the wheels to run upon; the one, *a*, elevated, for the flanged wheels of locomotive and ordinary rail-road carriages to pass along; the other, *b*, lower and flat, for the wheels of tram and other waggons, without flanges, to travel upon.

The manner of forming these peculiarly-shaped rails, shewn at A, in the drawing, will be understood by all engineers, and therefore need not be described.

The novelty of this invention consists merely in the shape of the rail, having the two surfaces described; by which the twofold advantages of a tramway, and a railway-bar, are combined. The seats or chairs B, must, of course, be made with suitable indentations, to receive the rails, and constitute firm bearings for them; and the rails may be firmly secured in each seat by a wedge *c*, driven laterally into the notch of the seat, as shewn.—[*Inrolled in the Petty Bag Office, July*, 1843.]

Specification drawn by Messrs. Newton and Son.

To THOMAS WRIGLEY, *of Bridge Hall Mills, Bury, in the county of Lancaster, paper manufacturer, for certain improvements in machinery for manufacturing paper.*—[Sealed 8th November, 1842.]

THESE improvements in machinery for manufacturing paper

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relate to that description of apparatus usually employed in the early part of such manufacture, and generally known by the name of the rag-engine; this engine or machine being employed for washing, separating, opening, and beating up the rags, and converting them into pulp, from which paper is subsequently to be manufactured.

The ordinary rag-engine consists simply of a vessel or chamber, in which the rags are placed, and saturated; and also washed, separated, opened, and beaten up, by the action of a cylinder or roll, the circumference or periphery of which is furnished with a series of blades, called roll-bars; and the bottom of the engine is also provided with a series of somewhat similar blades, commonly called plates. Then, as the roll revolves above the stationary plates, at the bottom of the rag-vessel, the rags are washed, separated, opened, beaten up, and converted into pulp, by the continuous action of the roll-bars and plates. The pieces of rags are, at the commencement of the operation, large and coarse, and the roll must consequently, at first, revolve at some distance above the plates; but, as the rags approach to complete saturation, and the fibres become opened, it is necessary to lower the roll nearer and nearer the bottom plates, until the roll and stationary plates just touch each other, and act closely upon the fibres, at the lowest point of the roll's depression, where the roll is retained until the pulp is beaten up, and made of sufficient fineness. The lowering of the roll, so as to obtain the pulp from the rags in the least time, and in the most advantageous manner, is a matter of great nicety, for the roll should be lowered more quickly at first than afterwards; also the roll, when arrived at its lowest point, must not continue there beyond a certain time, or a certain number of revolutions, otherwise the pulp will be beaten away and injured; the roll must also be elevated a little, and retained at that elevation, for the purpose of clearing the pulp from knots, and reducing it to a fit state to be made into paper. All this part of the process, which requires much care and judgment in the operator, and considerable expenditure of labour and time, is effected by means of machinery or apparatus, driven by power or manual labour, as hereinafter described.

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In Plate XI., fig. 1, is a side elevation of the rag-engine; fig. 2, is a transverse section, taken longitudinally through about the middle of the same; fig. 3, is a plan view of the improved apparatus detached, upon a larger scale; and fig. 4, is an elevation of the same. The vessel or chamber, in which the rags to be operated upon are placed, is shewn at *a*, *a*; and in about the centre of this vessel is placed the beating or triturating roll *b*, *b*. This roll is surrounded with the blades or roll-bars *c*, *c*, fig. 2. The roll is mounted upon a shaft *d*, *d*, one end of which is placed in a pedestal or bearing on the further side of the chamber *a*, and the other in a bearing or pedestal, upon the arm or lever *e*, *e**, fig. 1, which is supported by its fulcrum, at the end *e**, in one of the standards *f*, *f*, and at the other end by a pin, fixed in the connecting-rod *g*, *g*. At the upper end of this connecting-rod there is a cross-piece or head *h*, having turned pivots at each end, upon which are placed small rollers *i*, *i*, resting upon a horizontal cam *k*, *k*, which is made to revolve by gearing, as hereafter explained. This cam *k*, *k*, in connection with its accompanying gearing, causes the roll *b*, in the first place, to wash the rags a short time; then to be lowered at whatever rate is desired for breaking; to be retained at the lowest point for the required number of revolutions for beating; and to be raised and retained, as required, for the purpose of clearing the pulp. The upper or working edge of this cam is to be exactly shaped according to the action required by the engine-roll; as for instance, suppose the previous operation of washing to be completed, and the time required for the operation of the rag-engine to be three hours, one of which is required for lowering the roll, that, or the first division of the working surface of the cam *k*, *k*, must be so sloped or inclined, that, according to the speed at which it is driven, the rollers upon the cross-head shall be exactly that portion of the time descending the incline upon the cam, and, consequently, lowering the roll upon the plates *n*, fig. 2; and if the second hour shall be required for the roll to beat up the rags, the roll revolving all the time in contact with the plates, the second division of the cam *k*, *k*, must be so shaped (that is, level) that the roll shall be allowed to remain, during that period, at its

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lowest point; and if the third portion of time or hour shall be required for raising the roll again, either gradually or interruptedly, then the third division of the cam *k*, must be suitably shaped or inclined, so as to cause the cross-head to lift the roll during such interval or space of time; the particular shape of the inclined portions of the cam depending on the manner in which the manufacturer may wish the roll to approach or recede from the bottom plates, during its descent and ascent, respectively.

Its mode of connection and operation, in the rag-engine, is as follows:—Supposing that the rags, intended to be beaten up, are placed in the vessel *a*, (as shewn in fig. 2,) and motion is communicated, from a steam-engine or other power, to the further end of the shaft *d*,—the roll *b*, will thus be caused to revolve, and the rags washed, broken, and beaten up, as they proceed up the front weir *m*, over the bottom plates *n*, aud again round by the back weir *o*. There is a small pulley *p*, upon the near end of the shaft *d*, around which a band *q*, passes, and also around another pulley *r*, upon the cross-shaft *s*; upon this shaft is a worm *t*, gearing into a worm-wheel *u*, fixed npon another shaft *v*, below; upon the reverse end of which is a pinion *w*, gearing into a spur-wheel *x*, upon the end of a shaft *y*; and upon the centre of this shaft *y*, there is another worm *z*, gearing into a horizontal worm-wheel 1, upon which the cam *k*, *k*, is fixed; thus it will be seen that the requisite slow motion is communicated to the cam, which may be made to perform half a revolution in three hours; or it will be evident that half a revolution of the cam *k*, *k*, may be performed in any other given time, according to the calculation of the gearing employed. It is obvious that the shaft *y*, may be driven by manual labour, so as to give the required motion to the cam. Supposing now, at the beginning of the operation, the cross-head, bearing the lever and roll, to be at the highest point upon the cam *k*, *k*,—as its revolution commences, the roll will revolve, for a short time, on the level surface of the cam, and will then be lowered, in order to open the rags, and separate them, as required, until the cam *k*, *k*, has arrived at that point which governs the time that the roll remains at its lowest point, for the purpose of beating the

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rags into pulp; and as the cam *k*, *k*, still continues to revolve, and thus brings the opposite incline, on the third portion of its working surface, into action upon the cross-head, the roll will be raised, in order to clear the pulp from knots and other imperfections, and thus complete the operation of the engine. In order to raise the cross-head and roll to the height from which it descended, without loss of time, or to lift the cross-head entirely from off the cam, when requisite, a lever 2, or other suitable contrivance, may be attached to the apparatus; also a shaft may be passed across the rag-engine, and both ends of the roll may be raised, instead of one only, as above described.

Instead of completing the operation of converting the rags into pulp in one machine, as hereinbefore described, it is sometimes preferred to commence the operation in one engine and complete it in another; in such cases, a portion only of the cam, adapted to the performances of each engine, is employed, and the roll may be raised to the height from which it descended at the commencement of the operation, by a lever or other suitable apparatus, as above described, whenever (from that portion of the process assigned to this engine being complete) it is desirable that the roll should be returned to the point from which it descended, with as little loss of time as possible.

The arrangements and apparatus, hereinbefore described, and the application and construction of the cam, are stated by the patentee to be, according to his present experience, well adapted for carrying his invention into practice; but any intelligent mechanic will perceive, that many similar and well-known mechanical arrangements may be employed and adapted to the same purpose; as for instance, the same effect might be produced by a stationary cam, the rollers of the cross-head being made to move across its surface, by applying the power directly thereto; or by an interrupted screw, the thread having a suitable inclination, according to the rate at which the roll is required to ascend or descend; or by other inclined or suitably shaped surfaces, the application of which, to modifying motion, is well known.

The patentee does not claim, as his invention, the lowering

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and raising the roll of the rag-engine, that having been long practised; nor does he claim the lowering the roll of the rag-engine by mechanical apparatus,—a particular mode of gradually lowering the roll, by such apparatus, having been described in the specification of certain letters-patent, granted to Charles Edward Amos, on the 10th November, 1840;* nor does he claim the exclusive use of the several parts of the apparatus and arrangements, hereinbefore mentioned, except so far as the same may be used for the purposes of this invention, which consists in "the application of machinery, whereby the roll of the rag-engine, (whether for washing, breaking, opening, separating, beating up, and clearing the rags) in the manufacture of paper, may be held, lowered, caused to dwell, and beat up, when at its lowest point, for any given or required length of time, and raised again; thus completing, perfecting, or performing, the requisite operations of the rag-engine, by means of machinery, driven by power or manual labour, and self-acting, as above described."—[*Inrolled in the Petty Bag Office, May*, 1843.]

Specification drawn by Messrs. Newton and Son.

To Francis William Gerish, *of East-road, City-road, in the county of Middlesex, ironmonger, for improvements in apparatus to be used as a fire-escape; also applicable to other purposes where ladders are used.*—[Sealed 8th August, 1840.]

The improved apparatus, above mentioned, consists in the peculiar constructions of iron ladders represented in Plate XI. Fig. 1, is a front view of one of the ladders; it is formed in three parts or lengths, and the uprights *a*, *b*, *c*, are made of tubes; the upper ones *a*, *b*, sliding into the lower ones *c*, when the ladder is not in use. The rounds or steps *d*, of the lower part of the ladder, are affixed to stationary rings or sockets *e*; but the steps of the upper parts are secured to

* For specification of this patent, see Vol. XX., p. 153, Conjoined Series.

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sliding sockets *f*, which are retained in their proper places upon the uprights *a*, *b*, when the ladder is in an extended state, (as shewn in the drawing) by the links *g*. These links are attached to the sliding sockets by pin-joints, and are also connected, in pairs, to small intermediate pieces by pin-joints, in order that they may be doubled together when the ladder is in its contracted state.

Ropes or chains *i*, *j*, are employed for raising or expanding the ladder. The ropes *i*, are fastened to the lower ends of the uprights *b*, and carried over the pullies *k*, at the top of the uprights *c*, down to the windlasses or barrels *l*; the ropes *j*, are secured to the lower ends of the uprights *a*, and carried over the pullies *m*, at the top of the uprights *b*, down to the forks *n*, connected with the frames of the pullies *k*. Hence, by winding the ropes *i*, upon the windlasses, the uprights *b*, will be raised, and their upper ends, acting upon the ropes *j*, will cause the uprights *a*, to rise also; the moveable rounds or steps being carried up to their proper places by the links *g*. The ladder is furnished with a pair of rollers *o*, at its upper end, to facilitate its elevation against the side of a building. The form of the uprights *a*, *b*, *c*, is shewn, on an enlarged scale, in the horizontal section, fig. 2.

Fig. 3, is a front view of another expanding ladder; fig. 4, is a vertical section, taken on the line A, B, of fig. 3; and fig. 5, is a plan view of the uprights at one side of the ladder, when in its contracted state. This ladder consists of three parts or lengths *p*, *q*, *r*, similar to that just described; and the upper parts *p*, and *q*, are raised and lowered by means of the ropes or chains *s*, *t*, fastened to the steps, and passing over the pullies *u*, *v*; but the steps are, in this case, fixed, and the uprights, instead of being tubular, are formed into rectangular troughs.

The patentee claims the modes, herein described, of constructing iron ladders for fire-escapes, and other purposes for which such ladders may be required.—[*Inrolled in the Inrolment Office, February*, 1841.]

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To OVID TOPHAM, *of Whitecross-street, St. Luke's, in the county of Middlesex, engineer, for improvements in engines, machines, apparatus, or means for extinguishing or stopping the progress of fire in any room, or part, of different buildings, which may have become ignited,—such as noblemen or gentlemen's mansions, houses, factories, store and warehouses,—and, consequently, preserving them from destruction, and preventing the loss of life.*—[Sealed 21st December, 1841.]

THESE improvements consist in the arrangement of hydraulic engines and their appendages, for forcing water to any height, or to any part of a house, factory, warehouse, or other building. A tank or reservoir of water is to be placed in any convenient situation, either on the top of the building, or in any other contiguous place; from whence ranges of stationary connecting-pipes are to be laid, for leading the water in such directions as may be desired; and these, being furnished with cocks, in certain places, will afford an abundant supply of water, to be led off by flexible hose, screwed on to the nozzles of such cocks, to any parts of the building or premises where the fire may happen to take place.

As the forms of buildings, and the number and arrangement of the apartments therein, must vary, it would be impossible to shew, in one plan, all the details, or the precise disposition of the parts which the invention is intended to embrace. For the sake of illustration, however, a plan and sectional elevation of a building are given, with an arrangement of hydraulic apparatus applied thereto.

In Plate XII., fig. 1, is a plan of a series of apartments, say on the basement story of a house, warehouse, or public office; fig. 2, is a sectional elevation of a part of the same erection. In the elevation, *a*, is a tank, placed in the roof, which should be kept full of water at all times; *b*, *b*, *b*, a pipe, leading from the tank, which descends perpendicularly, or otherwise, and being always full of water, supplied by the tank, conveys it to every story of the building; *c*, *c*, *c*, are cocks, inserted into the descending-pipe, at every floor. To the nose of any of these cocks a flexible hose, with its jet-

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pipe, may be affixed by a socket-screw or union-joint; and in the event of fire occurring in any part of the building, the flexible hose is to be attached to the nose of that cock *c*, which may be nearest to the fire; when, by opening the way of the cock *c*, the water will flow from the tank *a*, down the pipe *b*, and, by the superincumbent pressure, will be forced out at the jet, and thrown to any part of the premises to which the jet may be directed. When the tank containing the water is situated in the lower part of the building, or on the ground contiguous, a double force-pump, represented at *d*, may be employed, in the event of fire occurring; the water, by that means, will be forced up the pipe *b*, and thence pass through any one of the cocks, when opened, and through the flexible hose and jet, as before described. The upper part of the pipe *b*, is represented in fig. 2, as having two branches, each with a stop-cock. The stop-cock *e*, belongs to that branch which leads from the lower part of the elevated tank *a*, and should be kept open, for the purpose of allowing the pipe *b*, to be at all times full of water. When the tank is to be filled, the cock *e*, must be shut, and the cock *f*, opened; the force-pump *d*, may then be employed to raise water into the tank; but at all other times the cock *f*, is to be kept closed.

The patentee states that he does not confine himself to the precise arrangement represented, as that must be subject to great variety, according to circumstances; he therefore claims such an arrangement of apparatus, upon the principle above shewn, as will afford an immediate and ready supply of water to any story of a building, for the extinction of fire.—[*Inrolled in the Petty Bag Office, June*, 1842.]

Specification drawn by Messrs. Newton and Son.

To James Clark, *of Glasgow, power-loom cloth manufacturer, for an improved mode of manufacturing certain descriptions of cloths.*—[Sealed 1st February, 1843.

This invention consists in the production of a fabric composed of cotton, silk, wool, or other fibrous material, or two or more of these materials, combined, in their unmanufactured state, with India-rubber cement.

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The fibrous material is subjected to the action of a carding-engine, and a sheet or sliver is thus produced; which, if not sufficiently thick, may be made so, by the application of another sliver thereto; it is then passed between a large pair of rollers, and receives from the upper one a coat of India-rubber cement, which is pressed by the rollers into the body of the sliver, and thus the fabric or cloth is formed. If the sliver is very thick, it is passed through another pair of rollers, and a coat of cement is applied to the other side of the fabric, by the under roller; it is then dried, by passing over steam-drying cylinders.

Another mode, described by the patentee, of manufacturing this improved fabric, is by placing two carding-engines opposite each other, and conducting the slivers therefrom through two separate pairs of rollers, by which they are coated with the cement; the two slivers are then passed through one pair of rollers, and, being thereby pressed together, form one fabric or cloth.

The patentee claims the mode of making cloths, of the description herein explained, by applying India-rubber cement, (dissolved India-rubber) by pressure, to a continuous fleece or layer of fibres.—[*Inrolled in the Petty Bag Office, August*, 1843.]

To JOHN SEALY, *of Bridgewater, merchant, for an improved tile.*—[Sealed 3rd December, 1842.]

THIS improvement consists in subjecting tiles, that have been made in the ordinary manner, and partially dried, to a uniform pressure, whereby an equality of thickness, and a regularity of shape, will be attained; and also a greater consistency will be given to the clay; thus rendering the tile less liable to crack by the heat of the kiln, and by the frost. When the tile is sufficiently dry to handle, the patentee places it on a "dressing table or horse," the upper surface of which is shaped according to the form of the tile; a metal roller, of a corresponding form, is then passed over the tile, with pressure, which effects the improvements above stated

The figures in Plate XI., represent several forms of the table and tiles. Fig. 1, shews a common flat tile, and the

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apparatus for compressing the same. *a*, is the table; *b*, the tile; and *c*, the roller, the handles of which run on the elevated sides of the table. A recess is made in the edge of the table to receive the knub of the tile, which has been previously formed. Fig. 2, represents a table and roller, suitable for an ordinary pantile. Fig. 3, is a perspective view of what the patentee denominates a single-channelled flat tile; one side of this tile is arched, and the other turned up at right angles, the arch being intended to lie over the turned-up side of the next adjacent tile, when laid on a roof. The roller and table used in the manufacture of this tile is shewn at fig. 4. Figs. 5, and 6, represent tiles with two or more channels, which are stated to be lighter than the ordinary tile, and better able to resist the wet at the junction; and figs. 7, and 8, shew the form of table and roller to be used in manufacturing the same.

The patentee claims the working and making an improved tile, as above described; and also the improved tile, of the forms shewn in figs. 3, 5, and 6, in whatever manner the tile of that form may be produced.—[*Inrolled in the Inrolment Office, February*, 1843.]

To Peter Kendall, *of Gifford's Hall, Suffolk, Esq., for an improved method or methods of connecting and disconnecting locomotive engines and railway carriages.*—[Sealed 17th April, 1841.]

An apparatus for connecting railway carriages and locomotive engines together, constitutes the subject of this patent; the advantages to be gained by its adoption, being, facility of disconnection, and the instantaneous separation of the engine from the carriages, in the event of the former running off the line of rails.

In Plate XII., fig. 1, is a plan of the under part of a railway carriage, furnished with this connecting apparatus; fig. 2, is a section on the line A, B, of fig. 1; and figs. 3, are separate views of the coupling-boss employed. *a*, is a rod, which passes freely through openings in the end-framing *b*,

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of the carriage, having its inner end secured to a bow-spring *c*; to the other end of the rod two spring-grippers or arms *d*, are fastened, and in the outer end of each an opening is made, for the reception of the two pins or axles *e*, of the coupling-boss *f*. On either side of the spring-grippers *d*, a smaller pair *g*, is bolted to the carriage-framing; and each pair of grippers is connected by a chain, from the hook of its coupling-boss, with the hind end of the preceding carriage or engine. Every carriage in the train is provided with a set of spring-grippers and coupling-bosses, and as long as all the carriages remain in the same line of traction, the bosses will be firmly held by their grippers; but if the engine should happen, by any accident, to run off the line, the angular pull upon the bosses of the next carriage will release their short axles from the openings in the ends of the grippers, and the engine will thus be separated from the train. The carriages composing a train are separated from each other, when desired, by pulling the coupling-bosses out of the line of parallelism with the cheeks of their respective grippers. A wedge should be suspended near each pair of grippers, for the purpose of opening them for the reception of their coupling-boss.

The patentee claims the method or methods, herein described, of connecting and disconnecting locomotive engines and railway carriages, however the mechanical details thereof may be immaterially varied or modified, and whether one, two, or more sets of coupling-bosses and spring-grippers are made use off for that purpose.—[*Inrolled in the Inrolment Office, October*, 1841.]

To George Ebenezer Doudney, *and* Edward Phillips Doudney, *of Mile End, Portsea, candle manufacturers, for improvements in the manufacture of dip and mould candles.*—[Sealed 17th February, 1843.]

This invention consists in manufacturing dip or mould tallow candles with platted wicks, made of coarser cotton yarn, and with fewer yarns in each wick than heretofore; the number of yarns being limited to forty. The necessary substance of

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wick, for burning tallow, is produced by the increased coarseness of the yarns, which have only sufficient twist to keep them in the form of yarn while being worked into plat, and are made from bleached cotton-waste. The cotton-waste should be of such a degree of coarseness that 1 lb. avoirdupoise will measure from 5000 to 5050 yards.

In manufacturing both dip and mould candles, the wicks are preferred to be of the following sizes:—For "short fours," the wicks are formed of three strands, each composed of thirteen yarns; for "long fours" and "short sixes," three strands of eleven yarns each; for "long sixes" and "short eights," three strands of eight yarns each; and for "long eights" and "short tens," three strands of six yarns each. If a greater degree of light is required from any of these sizes of candles, the number of yarns is increased, or coarser yarns are used; but coarser yarns are used in all those cases where the increased size of the wick would require more than forty yarns, of the degree of coarseness above mentioned.

The patentees claim the mode of manufacturing dip candles and mould candles, by combining therein platted cotton wicks, each composed of not more than forty yarns, as herein described.—[*Inrolled in the Inrolment Office, August*, 1843.]

To William Ward Andrews, *of Wolverhampton, ironmonger, for an improved coffee-pot.*—[Sealed 21st July, 1841.]

In Plate XII. is a sectional view of the improved coffee-pot. *a*, is a perforated box, for containing the coffee, furnished with a cover *b*, and secured to the lower part of the coffee-pot by the screw-collar *c*. The cover is fastened on by a lug and catch, at one side; and within the box is a perforated cone *d*, the holes of which are somewhat larger than those of the box *a*. *e*, is a water-chamber, communicating with the cone *d*, and box *a*, and with the cylinder *f*, in which the solid piston *g*, works.

The method of using this coffee-pot is as follows:—The coffee is first introduced into the box *a*, and the cover fastened on, and then the piston *g*, having been raised to the top of

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the cylinder, by means of the handle *h*, the requisite quantity of boiling water is poured in at the lip *i*, and forced, by the piston through the coffee, into the body *j*, of the coffee-pot. Any water which may happen to be on the top of the piston is delivered into the body of the coffee-pot, through the opening *k*, when the piston is raised.

The patentee, in conclusion, says, that his invention is susceptible of various modifications in form; for instance, the pump-cylinder may be placed over and communicate directly with the covered coffee-box, and form one with it, thus rising through the centre of the coffee-pot, instead of at one side, as shewn in the drawing; or the lower end of the pump-cylinder may be perforated, to form the coffee-box, and a cover fitted to the bottom, instead of the top of the box; or the main body of the coffee-pot may be used as the pump-cylinder, by fitting a solid piston thereto, with an escape-pipe, through which the water may rise, after it has been forced through the coffee-box, and empty itself into the body of the coffee-pot, above the piston.

He claims, as his invention, the improved coffee-pot, above described, whereby he is enabled to force the hot water (of which the coffee is to be made) through the coffee, by means of a solid piston and force-pump, while the said coffee is contained in a fixed, closed, and perforated box, as herein described.—[*Inrolled in the Inrolment Office, January*, 1842.]

To WILLIAM EDWARD NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in printing or delineating patterns on painted cloths, for floor-cloths, covers, and other uses,—being a communication.*—[Sealed 14th December, 1841.]

THIS invention, which has been communicated to the patentee by a foreigner, residing abroad, consists in a novel method of manufacturing floor-cloths and painted covers, whereby they are rendered more durable, and of better quality than can be done by the ordinary mode of conducting the manufacture.

The invention consists in depositing the pattern or design,

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which is to form the subject of the surface of the finished cloth, upon sheets of paper; which may be done by means of painting or printing, in thick colors, by hand, or by blocks stamped or impressed in the way ordinarily employed for painting and printing oil-cloth and such fabrics. By these means, the prominent parts of the pattern or design will be thickly incrusted upon the surface of the paper; and when this has become dry, thick adhesive compositions of color, to form the basis or ground of the pattern, are to be laid thereon. Upon this ground, compositions of hair, wool, cotton, or other fibrous materials, with adhesive matters, are to be spread, and pressed down by rollers, or otherwise; which fibrous materials will constitute the body of the fabric. When this body of the fabric has become hard and dry, its surface may be painted, or otherwise coated, to form the back of the floor-cloth or other covering, which operation completes the manufacture. The fabric is then laid down flat upon a floor, the paper surface being upwards; and after having been well soaked with water, the paper is to be completely drawn off or removed from the fabric, by rubbing or otherwise; and when perfectly cleaned, the pattern or design, first laid upon the paper, will appear as the face of the floor-cloth, or other cover, imbedded in the fabric and level with its ground colors; thereby producing an article, more level on its surface, and with a pattern more durable than has heretofore been obtained in such manufacture.

The sheets of paper, which may be of any quality (those made of flax or cotton fibres, and nearly white, are to be preferred), are, in the first place, to be joined together at their edges, by glue or paste, until they cover the area or dimensions of the desired cloth. The sheet, thus produced, is then to be laid out flat, and coated with a thick size of gelatine or glue, in a luke-warm state, which may be done by a sponge or brush; after which, the sheet must be dried in the air. A fold, similar to a hem, is then made along one edge of the paper, through which a ribbon or cord is to be passed, in order to prevent the paper being torn. This hem must be stitched without touching the ribbon or cord, in order that it may be perfectly free. Another hem of coarse cloth is then

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to be stitched to the opposite edge of the paper, taking care to leave a passage for a rod, by which the sheet is to be suspended whilst drying,—the ribbon being intended to keep it extended below.

It is upon these sheets of paper, when dry, after being prepared in this manner, that the impression of the pattern or design is to be made; either by means of a block or blocks, or with a pencil by hand, but with rather thicker colors than those ordinarily used for printing floor-cloths, and in the reverse way, it being intended to be seen on the opposite side. The smaller or finishing touches of the pattern or design must be first put on the paper, and upon this the broader or more solid parts of the subject; and these in such substance, that either from the thickness of the color, or by making two impressions of the same color, one upon the other, such a relief may be obtained, that the incrustation may be equal to at least a quarter of the thickness of the intended fabric. When the impression of the pattern is completed, and the colors set, the sheet should be dried, either in the open air or by artificial heat; and when perfectly dry, it should be covered, by means of a brush, with two or three layers of color for the ground of the design; the first must be mixed with oil varnish, and should be laid on very lightly, so that, by drying rapidly, it will not penetrate to the paper. The other layers, of more common colors, mixed with drying oil, must completely hide the relief of the pattern, and when they have successively become dry, a considerable body of an adhesive matter, or pigment of the same color, is to be applied. This adhesive matter should be previously thickened, in a heated state, so that, when cold, it will have the consistence of a thick jelly. It is to be spread upon the surface of the dry paint, and exposed, for a few minutes, to the air, which will be sufficient to render it very sticky; and when in this state, the sheet is covered with a quantity of down, short hair, wool, flax, tow, or other fibrous materials, which must be previously carded, and made into a wadding, of the proper thickness. Immediately this wadding is applied, the adhesive mixture lays hold of its fibres, and it may then be compressed by a rolling cylinder or other means.

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In order to make the materials adhere properly together, the several coatings must be well dried or hardened between each operation. The wadding may receive a layer of drying oil, (previously, however, covering it with a metallic cloth,) which is to penetrate all that part not impregnated with the adhesive substance; then the cylinder may immediately be passed over the fabric several times, in order to make the oil penetrate. When this last layer is perfectly dry, it is to be covered with a mixture, composed of white, yellow, or red chalk, mixed with water, to the consistence of a paste, and a sufficient quantity of drying oil added, to reduce it to the substance of a thick jelly; and when this is dry and polished, a coat of common paint may be applied; or the back of the fabric may be made to resemble velvet, by powdering flock, or fine fibres of wool, or other matters, in the ordinary manner, upon a coating of the adhesive pigment before mentioned.

When this is complete, and the whole dry, the sheet must be turned over, placing the paper side upwards, when the paper may be easily removed by wetting it, and dissolving the glue or gelatine. A brush or sponge, rubbed well over it with hot water, will remove the paper; and this operation being finished, the right side of the cloth is laid bare, with the pattern perfectly exposed, though incrusted in the fabric.

All that remains to be done is to dry the cloth well, and give its face a light polish with very fine pounce-powder, by means of a rubber, made of woollen cloth or wool. After this, the face may be varnished with oil varnish, if required.

If it should be desired to use a woven fabric for the foundation, instead of wadding, as above described, it may be readily made to adhere to the design on the paper and by the same means as above described; a thin layer of gum-lac, dissolved in alcohol, being applied previous to the chalk mixture; and when quite hard, the back may be polished, in order to receive the last coat of either paint or velveting.

If felt is required to be used, it is necessary first to stretch it, and apply to its surface two coats of the plaster, or chalk mixture, before mentioned; each being well dried. The surface is then polished with pounded freestone; and after applying a coat of paint, mixed thickly with drying oil, it is

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dried and polished again. When brought into this state, a coat of gum-lac, dissolved in alcohol, is to be laid upon it, when the fabric, as before prepared with the pattern thereon, may be applied to the substance of felt, and made to adhere thereto by means of a hot cylinder; the paper may then be removed, and the surface polished and varnished, as before described.

For hangings, which are required to be very supple or flexible, and light, instead of the hair wadding or tow, fine cotton, with about a quarter of its quantity of waste silk, may be employed. After having applied the wadding to the adhesive mixture, and pressed the fabric under the cylinder, it should be well dried, and that part of the cotton which does not adhere must be removed, by means of a comb, so that the back of the hanging will then resemble a swan skin.

The patentee claims the peculiar mode or process above described, for the manufacture of floor-cloths, table-covers, hangings for rooms, and other similar articles, by first placing the design upon paper whereby the colors, forming the pattern or design, are incrusted into and form part of the body of the fabric; and afterwards applying various materials to the pattern, to render the fabric of proper strength and substance, as above described.—[*Inrolled in the Petty Bag Office, June,* 1842.]

Specification drawn by Messrs. Newton and Son.

To Charles Heard Wild, *of Birmingham, engineer, for an improved switch for railway purposes.*—[Sealed 3rd December, 1842.]

The description of this invention commences with the statement, that the principal disadvantages resulting from the present construction of railway switches are, inaccuracy of gauge, and want of safety; the patentee's object, therefore, is to construct a switch which shall be perfect in gauge, when opened for diverging lines, and quite safe. In order to effect this, he employs "safety tongue-rails," which may be made

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moveable into line with the ordinary rails, or they may be stationary, and the ordinary rails moveable into line with them; one principal feature of the invention being, that whatever may be the mechanical means adopted to effect either of these movements, those means must be such as will cause the moveable rails (of which there are two pairs) to move through certain different degrees of space, although those means are acted upon by one lever, always moving through one uniform degree of space.

Four modifications of the improved switch are shewn in the drawings attached to the specification; two of them having fixed safety tongue-rails, and other two having moveable safety tongue-rails.

In Plate XII., fig. 1, is a plan view of the first construction of switch; and fig. 2, is a transverse section, on an enlarged scale, of the chair *a*, on which the ends of the rails move. *c*, *d*, *e*, *f*, are the rails of the main line, and *g*, *h*, those of the diverging or branch line; the ends of these rails meet upon the chairs *a*, *b*, and the rails *c*, *d*, *e*, *h*, are moveable thereon; but the safety tongue-rails *f*, *g*, are fixed. The movement of the rails *c*, *d*, *e*, *h*, in order to transfer a train on to the diverging line, is effected by means of the lever *i*, affixed to the axis *j*; and the return of the rails into their ordinary position is produced by the counterpoise weight *k*, suspended from the arm of the lever, and contained in the box or case *l*, (represented in section, also on an enlarged scale, at fig. 3,) which is placed at the side of the railway. From the axis *j*, the movement of the lever is communicated, through the arm *m*, and rod *n*, to the rails *c*, *d*, and thence to the rails *e*, *h*, by the "extension lever-bars" *o*, *p*, bolted to them, and embracing the rod *n*, with their forked ends, as shewn in the detached view, fig. 4. By this mode of connection, the rails *c*, *d*, will be caused to move through a greater degree of space than the rails *e*, *h*, as before mentioned, in order to assume the positions indicated by the dotted lines, for transferring a train on to the diverging line.

Fig. 5, is a plan view of the second modification of the switch; and fig. 6, is an enlarged detached view of the parts for giving motion thereto. In this switch, the extension

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lever-bars *o*, *p*, are dispensed with, and a rod *q*, is substituted for them; this rod is worked by an arm *r*, on the axis *j*, fig. 6; and the movement of the rails through different degrees of space is accomplished by making the arm *r*, shorter than the arm *m*, which works the other rod *n*.

Fig. 7, is a plan view of the third modification of the switch, in which the safety tongue-rails *f*, *g*, are moveable, together with the rails *c*, *d*; and the rails *e*, *h*, are fixed. The rails *f*, *g*, are moved by the rod *n*, from which motion is also communicated to the rails *c*, *d*, through the levers *s*; these levers turn upon pivots in the chairs *a*, *b*, as represented at the enlarged view, fig. 8, and are forked at each end; their longer ends being retained between nuts upon the rod *n*, and their shorter ends clasping the extremities of the rails *c*, *d*.

In the fourth modification, the safety tongue-rails are also moveable, together with the rails *c*, *d*; the required movements are produced by means of two connecting-rods, acting in a similar manner to the rods *n*, *q*, fig. 5.

The patentee claims, generally, as his invention, an improved safety tongue-rail switch, in which the ordinary main line-rails *c*, *d*, are made to move in connection with the ordinary rails *e*, *h*, or in connection with the safety tongue-rails *f*, *g*. He also claims the safety-switch, hereinbefore described, in which the moveable rails (whether the tongue-rails, or the ordinary rails, are made the moveable ones) are made to slide through different degrees of space; Firstly, as shewn in fig. 1, (where the tongue-rails are the fixed rails) by means of the extension lever-bars *o*, *p*; or by means of the two connecting-rods *n*, *q*, seen in fig. 5, where the tongue-rails are also fixed; and Secondly, as shewn in fig. 7, (where the tongue-rails are moveable) by means of the levers *s*; or by means of the two connecting-rods, as described under the fourth modification.—[*Inrolled in the Inrolment Office, June*, 1843.]

To Arthur Harvie, *of Wilmington-square, Gent., for improvements in the process of vinous fermentation.*—[Sealed 8th November, 1842.]

The improvements, proposed by the patentee, consist in per-

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forming the process of vinous fermentation in close vessels, so that the gas evolved may be conducted into liquids undergoing fermentation; and it may also be further employed for saturating any liquids with carbonic acid, which may require such impregnation.

In conducting the process, four air-tight vats or vessels are preferred to be used, but a greater number may be employed if required. Nos. 1, 2, and 3, are fermenting-vats; and No. 4, may contain a solution of potash, a solution of sub-acetate of lead, water, or other fluid desired to be impregnated with carbonic acid gas. The fluid to be fermented is poured into the vessels 1, 2, and 3, through an opening in the top; and they are connected together by pipes, rising out of the tops of the several vessels, and leading from one to the other. An additional pipe proceeds from the vessel 1, to 3, for the purpose of conducting back the gas to the latter vessel; and a pipe connects 3, and 4, together, for the purpose of drawing off the surplus gas, in order to impregnate the liquid, contained in the vessel 4, with carbonic acid; but, to allow of the free passing and repassing of the gas through the fermenting-vats, the pipe of the vat 4, descends much lower into the liquid, contained therein, than in the other vats, and by that means a greater degree of pressure is given to the gas; its escape, therefore, into that vessel, will not be so free as a return to the fermenting-vats, and, consequently, it will pass and repass through the fluid which is undergoing fermentation, before it finally escapes into the vat 4, and is absorbed by the liquid therein. When the process of fermentation is completed, (which should be carried on at as low a temperature as possible, in order to slowly evolve the carbonic acid gas,) the fluid may be drawn off by cocks, attached to the bottom of the vats.

The advantages, stated by the patentee, to arise in the adoption of close vessels, as above described, for the purpose of vinous fermentation, are, a more full and complete decomposition of matter, made subject to vinous fermentation, and the additional employment of the gas, when it escapes into the vessel 4. He claims "the method or process of conducting vinous fermentation in close vessels, by conveying the gas

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evolved into fluids which are undergoing fermentation, as herein described."—[*Inrolled in the Inrolment Office, May,* 1843.]

To EDWARD ROBERT RIGBY, *and* CHARLES JOHN RIGBY, *of Gracechurch-street, brush manufacturers, and co-partners, for an improvement or improvements in the manufacture of certain articles in which bristles have been or are now used.*—[Sealed 21st December, 1842.]

THIS invention consists in using the horny parts of feathers, quills, or pens, divided into narrow strips or fibres, in the manufacture of brushes, instead of bristles. The feathery portion is first stripped off, and the quill is divided into two parts, by inserting a knife in one of the soft sides of the shaft; the soft substance or pith is then removed, so as to leave a nearly flat transparent substance, of a smooth horny appearance, to be divided into fibres. With this view, the divided quills are boiled in water, just long enough to render them very soft, and reduce the pith to the consistence of pulp, which is then cleared away; for this purpose, a kind of scraper, known as a "plumber's shave," may be used, by which the principal part of the pith can be scraped away, and, with a piece of wood or other rough surface, the smaller particles can be cleared off. The portions of quills, thus prepared, are divided into narrow strips or fibres, by passing them, while still damp, between a pair of revolving circular cutters or dies, the peripheries of which are covered with a series of grooves, corresponding to the required width of the fibres. As the fibres are delivered from the cutters, they are placed between two boards, under a slight pressure, for the purpose of keeping them straight, and, when perfectly dry, they are ready for use. The method of fixing and using the fibres is the same as when bristles are used; and they may be employed either alone, or in combination with bristles.

The color of the fibres will be the same as the original quill or feather; but, if desired, they may be dyed with the same materials as are used for dyeing bristles.

The claims made by the patentees are, Firstly, the use, in

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the manufacture of brushes, of fibres, cut or divided from the hard, firm, or horny part of feathers, quills, or pens, instead of bristles, and whether used exclusively, or in combination with bristles; and Secondly, the method of cutting or dividing and preparing the said fibres, as hereinbefore described.—[*Inrolled in the Petty Bag Office, June,* 1843.]

To JOHN ROTHWELL, *of Great Bolton, in the county of Lancaster, grocer, for a certain composition and preparation to promote the ignition and combustion of coke, coal, and other combustible substances, in stoves, furnaces, and grates.*—[Sealed 5th November, 1842.]

THIS composition is produced by combining sawdust, dried turf, chaff, chopped straw or hay, with resin, sulphur, pitch, gas-tar, or other similar inflammable materials.

It is made in the following manner (sawdust being used as the vegetable substance, and amber resin as the inflammable agent; but any of the above materials may be substituted for them) :—2 lbs. of amber resin are melted with 1 oz. of cod oil, and 1 oz., or as much gas-tar, for coloring matter, as will give the composition a chocolate color, when made; with this mixture, while in a melted state, 1½ lb. of sawdust, produced from hard wood, or 2 lbs. of sawdust, from soft wood, are thoroughly incorporated; the sawdust being partially dried, and used in a warm state. The composition is now transferred into moulds, in which it is converted, by pressure, into cakes of the required size; and is then removed therefrom, and allowed to cool.

From the above quantities of ingredients, the patentee prefers to make thirty cakes, of three inches in diameter, and three quarters of an inch thick, with a hole, one inch in diameter, through the centre, to promote combustion.

The patentee claims the manufacture, in the manner above described, of cakes or lumps, composed of saw dust, or other vegetable substances, above named, and one or more inflammable agents, as aforesaid, to be used as fuel, and for the purpose of promoting the ignition and combustion of coke, coal, and other combustible substances, in stoves, furnaces, and grates.—[*Inrolled in the Inrolment Office, May,* 1842.]

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Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 208, Vol. XXIII.)

March 21st, 1843.

The PRESIDENT in the Chair.

No. 445. "Description of the Blast Furnaces and of the Barrow used for filling the Charges of Mine and Coke into them, at the Butterley Iron-Works, Derbyshire." By S. C. Kreeft, Grad. Inst., C. E.

THE three smelting furnaces described in this communication are situated at Butterley, in Derbyshire; and three others, belonging to the same proprietor, exist at Condor Park Forge, about 2½ miles distant, where their produce is converted into malleable iron.

In the internal form or dimensions of these furnaces there is not any peculiarity; the diameter over the hearth is 4 feet, over the boshes 15 feet, and at the charging-plate 8 feet,—the total height being 45 feet.

The stacks, however, differ from the ordinary form in their external construction. The base of each is 40 feet square, battering inwards at an angle of 71° (3 inches to 1 foot); the quoin-stones and course work being laid at right-angles to the battering line, or at an angle of 16° with the horizon. Instead of the usual semicircular arches over the tuyeres, pointed Egyptian arches are substituted, and an open vertical joint or separation in the masonry is left from the apex of the arch up to the top of the stack on all four sides. This is done for the purpose of obviating the evils generally arising from the expansion and contraction of the stack in heating and cooling, from which the keystone of the semicircular arch usually falls, and the work cracks all around. With the pointed arch, the vertical joint in the masonry merely opens from the heat, and in contracting, resumes its former position, without any injury to the other joints of masonry, or deranging any of the archstones. The stacks are confined in the usual manner by wrought-iron braces, 2 inches diameter, built into the walls, with washer-plates and cotters at the extremities.

The mode of filling or supplying the materials into the furnace, is particularly described: it is by means of a circular barrow of

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wrought-iron, running on four wheels, the shafts by which it is guided, being so arranged as to form a steel-yard balance for weighing the contents of the barrow; the bottom is conical, and is capable of being raised or lowered by a rack and pinion, which is worked by a rod placed between the shafts, so that when the workman has pushed the barrow over the furnace-mouth, he can, by turning a handle, lower the conical bottom and distribute the materials equally around the interior periphery of the furnace. This regularity in depositing the materials is of importance to the good working of a furnace, and would alone render the barrow an improvement on the ordinary mode of filling, but it is also found to be more economical in every respect.

The charge for good forge pig iron is,—

Coal	9 cwt.
Argillaceous iron ore from the coal measures	10½ „
Calcareous ore from the Peak of Derbyshire	2 „
Limestone	3 „

4¼ charges produce 1 ton of iron, or 38 cwt. of coal to 1 ton of iron.

The average produce of each furnace is from 90 tons to 120 tons per week.

The average results of yield of the furnaces may be taken thus:—

For the Years.....	1839.			1840.		
	Tons.	cwts.	qrs.	Tons.	cwt.	qrs.
Calcined Mine used	18,484	7	3	19,521	19	2
Peak ore used	.....			676	16	0
Average mine used per ton of iron...	2·76	0	0	2·66	0	0
Limestone used	6·794	15	3	6·694	0	1
Average limestone per ton of iron...	·99	0	0	·88	0	0
	Tons.	Tons.	cwt.	Tons.	cwt.	
Average quantity of coals per ton of iron } No. of charges 5·26, or ..... }	2·37	= 2	7	2	4	
Coal to blast engine	·45	= 0	9	0	7½	
,, to heating blast	·25	= 0	5	0	5½	
,, to calcine mine	·40	= 0	8	0	9	
Tons.....	3·47, or 3		9	3	6	
Quantity of metal made	6,822	5	0	7,630	3	

Three of the furnaces are blown with air, heated to about 680° Fahrenheit.

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The engine has a blowing cylinder of 80 inches diameter, with 8-feet stroke, discharging 558 cubic feet of atmospheric air at each stroke, under a pressure of 3 lbs. per square inch, or about 7,800 cubic feet per minute; the diameters of the nozzles of the blast-pipes vary from 2¾ to 3 inches, according to circumstances.

The principal dimensions of the furnaces are given, and the communication is illustrated by two drawings of the furnace and the barrow, in plan and elevation, with details of construction.

No. 600. "Description of the Automaton Balance for weighing Coins, invented by William Cotton, Esq., Governor of the Bank of England."—By Thomas Oldham, Assoc. Inst., C. E.

THE paper first gives a brief notice of a portion of the bullion transactions of the Bank of England, in order to explain the difficulties which led to the invention of the machine.

The new coinage first arrives at the Bank from the Mint in what are called "journies,"—a single journey weighing 15 lbs., and containing 701 sovereigns. The officers of the Mint are allowed 12 grains plus in every pound-weight of metal, for the irregularities incidental to working it into coin, but they usually work to within half that allowance, which is technically called "the remedy."

There have been coined for the Bank lately 8,000,000 of sovereigns, and the greatest variation from the weight allowed was only 60 grains, or one-third of the remedy; each sovereign should contain a portion of this remedy, to allow for wear in public use, and this extraordinary subdivision of the metal is invariably obtained.

The usual delivery of new coinage at the Bank contains 100 journies, which is counted by weight only,—that is, 200 sovereigns are counted into one scale, and the rest of the delivery is weighed in parcels which balance these 200, and this is all the counting the new coinage receives The regularity and precision of the manipulations at the Mint obviate the necessity of any further examination, either as regards the gross amount or the weight of an individual piece.

When the currency returns to the Bank from the public, it becomes necessary to ascertain if it has been reduced below the standard weight, and this imposes an arduous duty on the officers of the Bank. The amount of gold paid daily over the Bank-counter varies considerably, but 30,000 may be taken as a rough

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average, and hence arises a tedious, irksome, and expensive process in weighing so large a number of pieces singly, and in quick succession, separating, at the same time, the light from the standard coin.

The mode of weighing coins by hand requires much dexterity, practice, and attention; but, in spite of all these, errors were inevitable, and it was to obviate these that the machine was invented by Mr. Cotton, the Governor of the Bank of England: it was constructed from his plans, by Mr. Napier, and is thus described:—

Its exterior presents a plain brass case, with a small hopper tube on the top plate, about 4½ inches from which, there is an opening in the top plate. In this opening is seen a platform in the form of a quadrant. This platform is suspended above one end of the beam, and is to receive the coin to be weighed. On one side of the case is a till—to receive the sovereigns as they are weighed—partitioned so that one division is left for standard coin, and the other for such as are light. There is a sliding door to each division, for removing the coins at pleasure. The machine may be worked like a clock, with a weight, or by any simple application of power.

Its visible action is as follows:—The hopper being filled with gold, upon setting the machine in motion, it immediately places a sovereign on the little platform, which serves, as already stated, in place of a scale-plan; and if it is of standard weight, a small tongue comes rapidly forward and pushes the sovereign into that side of the till allotted to such coin; if light, another, and similar tongue to the first, pushes the sovereign into the other side of the till. The action of these tongues is at right angles to each other.

While a sovereign is being weighed, a succeeding one is on its way from the hopper to the platform, and the moment the preceding sovereign is disposed of, according to its value, another is placed in its stead. To keep the hopper supplied with gold, and remove it from the till as it is filled, is all the attendance necessary.

The more minute parts of the mechanical arrangement of the machine, such as the fulcrum, the forceps, &c., are described in detail, and the following statement by Mr. Miller is given, as a comparison with the old method of weighing:—

"With the bullion-scales 4,000 may be stated as the number a person can weigh in six hours. As the sovereigns now tendered at the Bank-counter are most of them new, the scale dips quickly

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in weighing, and one person can weigh 5,000 in six hours; but a short time ago, before the issue of the new coinage, the same person could only weigh 3000, as it took a longer time for the scales to indicate.

"The bullion-scales cannot indicate nearer than 4-100ths of a grain, at the above rate.

"The machine is perfectly free from the sources of error to which the scales are subject, and weighs as quickly, whether sovereigns are new and of full weight, or old and doubtful; it can weigh 10,000 in six hours, and divide coin varying only one-fiftieth of a grain."

The paper is illustrated by two drawings of the internal arrangement of the machine; and a model, showing the action of the tongues and platform.

Mr. Oldham exhibited the automaton balance at work, weighing coin; and after describing, with the aid of a diagram and model, the action of some of the more delicate parts of the machine, he observed, that in seeking to obtain extraordinary performances by machinery, mechanical propriety of construction was too often overlooked, and premature deterioration, in the action of many parts, was the result.

The automaton balance was peculiarly worthy of notice, from the judgment exercised in its relative proportions, as was proved by the fact that, after being at work for several months, it had become more delicate in detecting slight variations, between standard and light coin, than when it was first constructed.

Mr. Cotton's object in this invention should be well understood. Public convenience demanded great accuracy in weighing the currency; by the ordinary mode of weighing gold with the bullion scales,—although it was due to the bank-tellers to state, that they gave the utmost attention to their monotonous duty,—it was nearly impossible to guard against the various difficulties detailed in the paper. The injury sustained by the optic nerve, from constantly watching the indicator of the scales, was a serious inconvenience to the operative, which, coupled with the incidental sources of error referred to, created even greater absence of delicacy than the paper stated. Errors, to the amount of one-third, or even half a grain, were not unfrequent.

By the "automaton balance," the number weighed in a given time was increased, and undeviating accuracy obtained. The delicacy of the instrument was such, that from thirty to thirty-five coins

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per minute could be passed through the machine, detecting a difference of only one-fiftieth of a grain.

It should be mentioned, that much greater delicacy could be accomplished; that is, to the one-hundredth of a grain, but not at the same rate; because it would be understood that a slow action of the beam was necessary for very small variations, and that must regulate the speed of working; but such delicacy was beyond all useful purposes in those transactions which it was intended to improve.

Mr. Cotton said that his attention had been attracted to the point by the inconveniences to which the "tellers" were subjected in weighing gold for the public: with balances so delicately constructed as the bullion scales, the agitation of the air, by the sudden opening of a door, or even by the breathing of those around, sufficed to cause errors. It was possible, also, by pressing the fulcrum against the bridle, to produce such a degree of friction as materially to interfere with accuracy; and the tellers confessed, that after weighing two or three thousand coins, the sight was injured, and they no longer observed with the same degree of correctness. He therefore imagined that a machine might be contrived, which, being defended from external influence, might weigh coins as fast as by hand, and within one-fourth of a grain; but he certainly did not contemplate attaining such perfection as the machine now possessed. His first idea was, that the light coins should be taken off by forceps, and that those of average weight should be pushed off by the succeeding ones; but it was found, that the slightest inaccuracy in the milled edges sufficed to give them a wrong direction: therefore, when he made the first rough sketch, and consulted with his friend, the late Mr. Ewart, he recommended that Mr. Napier, of York-road, Lambeth, should be employed to make the machine, and to him was due the suggestion of the two alternately advancing tongues, as well as several other arrangements of the machinery, which he had so successfully constructed.

When the first machine was tried, out of one thousand sovereigns, one hundred and sixty were found to be light, They were given to a teller to be verified, and he returned several of them as being of the proper weight; but on again weighing them more carefully, the result given by the machine was found to be correct. As an instance of how many circumstances should be taken into consideration in delicate machines, he might mention, that after being used for a time, the machine varied in its results,

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and on examination it was discovered, that the end of the lever, which traversed the pendant, had become magnetic, and thus affected the balance. An ivory end was substituted, and ever since that period its accuracy had been maintained.

Mr. W. Miller observed, that the efficiency of any scales must be determined, in a great degree, by the fineness of the edge of the fulcrum of the beam; and it would be easily imagined that the friction, to which the edge in a pair of bullion scales was subjected, whilst weighing five or six thousand sovereigns per day, must soon impair its delicacy, and consequently, the efficiency of the whole apparatus; for, whether the sovereigns were light or heavy, the beam must turn upon its fulcrum. Such was not the case with Mr. Cotton's machine; its beam did not act at all, unless a light sovereign was placed upon the platform; so that among one thousand sovereigns, if only one hundred were light, the beam of the machine would only move one hundred times, while that of the ordinary scales would oscillate one thousand times. An immense advantage was thus given to the machine in point of durability.

All weighing was but an approach to correctness, and the nearest point to which the best kind of common scales were sensible, might be stated as 3-100ths of a grain, and one-fourth of a grain would hardly cover their errors; but the machine was sensible to 5-1000ths of a grain, and 3-100ths would fully cover its errors, which were not a twentieth part so numerous as those of the scales.

Mr. Fairbairn exhibited a model, showing the plans, sections, and architectural elevation of a Woollen Factory, to be constructed of cast and wrought iron, near the town of Izmet (Turkey), for the Sublime Porte.

Mr. Fairbairn said that, in 1839, he visited Constantinople under the instructions of the late Sultan Mahomed, and reported upon nearly all the government works. Their extension was checked by the death of that prince, but the present Sultan was disposed to carry them into effect, and by his orders, Mr. Ohanes Dadian had arrived in England, in furtherance of the plans for ameliorating the state of the Turkish community, by introducing useful arts and manufactures, in which he was aided by his Excellency Ali Effendi, the Ambassador to the Court of England, and the Consul-general, Mr. Edward Zohrab.

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Almost all the houses, and many of the public buildings, in Turkey, being constructed of timber, destructive fires were frequent. In many parts of the country the common building materials were expensive; iron had therefore been resorted to for construction, and Mr. Fairbairn had already sent over an iron house for a corn-mill, 50 feet long, 25 feet wide, of three stories in height, and with an iron roof. It was furnished in 1840, and erected at Constantinople in the succeeding year.

The success of this attempt induced a second order, which was for an extensive woollen factory, to be composed entirely of cast-iron plates, the interior being formed throughout of brick arches, upon cast-iron columns and bearers, with an iron roof. He then described, in detail, the construction of the different parts of the building, and the machinery, which would be driven by a fall of water of 25 feet in height, of the computed average power of 180 horses.

Several ingenious devices were described for preventing any objectionable effects from the high conducting power of the metal. The piers between the windows were hollow, so as to admit a current of air through during the hot season; and the iron roofs were so arranged as to have beneath them a coating of plaster, to serve as a non-conducting substance.

The two principal rooms were described to be 272 feet long, 40 feet wide, and 20 feet high; and 280 feet long, 20 feet wide, and 20 feet high; with a great number of other rooms, for the several processes in the manufacture of coarse woollen cloths, for the counting-houses and apartments of the directors, and for the reception of the sultan, &c.

The area of the inclosed surface, including the court-yard and buildings, was nearly 3 acres, or ..... 110,621 square feet.

The floor surface in the basement rooms = 16,480 ,,

Ditto in the upper rooms = 54,616 ,,

March 28th, 1843.

The PRESIDENT in the Chair.

No. 599. "Experiments upon Cast and Malleable Iron, at the Milton Iron Works, Yorkshire, in February, 1843." By David Mushet, Assoc. Inst., C. E.

THE blast furnaces at Milton had been for a long period worked with heated air, generally under a pressure of 3 lbs. per square

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inch, and each worked with two nozzles on the blast-pipes of $2\frac{1}{2}$ inches and $2\frac{9}{16}$ inches in diameter. The apparatus requiring to be renewed, a quantity of iron was made by cold blast, which, as the materials or other circumstances of manufacture were not in any way changed, offered an opportunity of testing the relative strength of the two sorts of iron, of which Messrs. Graham and Co., the proprietors, took advantage, and secured the assistance of Mr. Mushet to conduct the experiments,

A strong wooden frame was erected, upon which were fixed iron supports, at 4 feet 6 inches apart, for sustaining the bars to be proved. A bar of iron, planed perfectly true, with a dove-tailed grove and a graduated brass scale in it, was used for ascertaining the deflection.

The bars, to be experimented upon, were all cast alike, 5 feet long and 1 inch square, and cooled with equal precaution. The results are given in a series of tables, of which the following are the average results :—

Table	No of Experiments.	Quality of Iron.	Specific Gravity.	Breaking Weight in lbs.	Deflection in Inches.	Impact.
1	12	No. 4. Cold-blast iron re-melted in the cupola, mottled or approaching to white.....	7.153	442	.9418	427
2	12	Same iron re-melted in the cupola with an increased quantity of coke produced grey iron ..	7.054	435	1.1916	519
3	12	No. 3. Hot-blast iron re-melted in the cupola..	7.012	520	1.542	782
4	13	Nos. 3. and 4. Hot-blast iron remelted in an air furnace with coal	7.107	610½	1·532	940
5	10	No. 1. Hot-blast iron cast from the blast furnace	7.012	439	1·56	686
6	12	No. 3. Hot-blast iron ditto..	7.046	439	1·43	630

The results of these tables are examined, and among the deductions drawn from them are—that the Milton cold-blast iron is rather deficient in strength; that the hot-blast iron is stronger than cold-blast, when re-melted in a cupola with coke; that hot-blast iron from the furnace is equal in strength to the average of the two sets of specimens of cold-blast re-melted in the cupola; that the No. 3 iron from the blast furnace is not stronger than No. 1 quality. The general results show, not only the superiority

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of the Milton hot-blast iron over that made by cold-blast, at the same furnaces, but over that of a very large number of works, as shown by the following comparative table taken from Mr. Fairbairn's report in 1838:—

				lbs.
Milton, hot-blast iron,	No.	3	Air furnace	610½
Ditto, hot-blast	„	3	Cupola	520
Ponkey, cold-blast	„	3		581
Bute, ditto	„	1		491
Wind-mill End, ditto	„	2		489
Old Park, ditto	„	2		485½
Lowmoor, ditto	„	2		472
Buffery, ditto	„	1		463
Brimbo, ditto	„	2		459
Oldberry, ditto	„	2		455
Adelphi, ditto	„	2		449
Blaina, ditto	„	3		448
Devon, ditto	„	3		448
Frood, ditto	„	2		447
Milton, ditto	„	4		438½
Elsecar, ditto	„	2		427

The waste in re-melting the hot-blast iron, was under 2 per cent.

	Cwt.	qrs.	lbs.
There was charged into the cupola, No. 3, pig-iron .	20	1	0
Pigs and scraps obtained	19	3	14
	0	1	14

The results of the experiments upon malleable iron made from hot-blast pig, and plate, show extreme ductility, when subjected to blows of a hammer 24 lbs. weight, of which one example will suffice.

A bolt 2¼ inches diameter, puddled from refined metal, notched half round to the depth of one-eighth of an inch, required 120 blows to break it.

Mr. Cottam remarked, that the paper would have been more satisfactory, if it had stated more particularly the progressive additions of the weights, the intervals of loading, and the length of the periods during which the bars ramained loaded. He had found that when a beam was near the point of fracture, if the weights were added quickly it would apparently bear more, than if a certain time was suffered to elapse between their application. His practice in experimenting was to make small additions of weight, at given intervals, which might be increased in length

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toward the point of fracture; more correct results were thus obtained.

Mr. Lowe believed, that in making iron, the main consideration, after selecting good materials, was to proportion them according to the hygrometric state of the atmosphere.

Mr. Parkes observed, that the experiments on the strength of wrought-iron bars could scarcely be received as conclusive, as the power employed had been variable and ill-defined. If a given weight had been allowed to drop from a certain height, and the incisions in the bars had been made with precision by a machine, the power required to produce fracture could have been easily calculated, as regarded the impact.

Mr. Farey observed, that notwithstanding the difference between the results recorded in the paper, and those arrived at by Messrs. Fairbairn and Hodgkinson, he was inclined to place confidence in them on account of Mr. Mushet's known accuracy as an observer. He thought that the disrepute into which hot-blast iron had fallen was unmerited, that it was occasioned by want of care, and the use of inferior materials in the manufacture. He considered Mr. Neilson's invention a most important improvement in metallurgic operations, but it had been abused because, by its means, ores which were formerly difficult of reduction, and therefore thrown aside, had since been economically fused, without due regard to their chemical constitution, and the metal produced was variable in quality, and sometimes deficient in strength. Nevertheless, Mr. Mushet's experiments showed that when proper care was exercised in the selection of the materials, and in the working of the furnace, the Milton hot-blast iron, when remelted in the air furnace, attained the high breaking weight of 610½ lbs., which was greater than that of the best specimens of cold-blast iron.

Mr. Farey then described at length the chemical combinations which occurred in the blast furnace. The general result was, that the use of hot-blast accelerated the process of separating the oxygen from the ore, and of replacing it by carbon, rendering also the subsequent fusion more rapid and complete. A great advantage was obtained by avoiding the cooling effect, which was formerly produced by the introduction of a quantity of cold air under pressure: the point of fusion was higher up in the furnace, and the quality of the metal, when it fell into the hearth, was not injured by being blown upon, as it was protected by the covering of liquid slag, at a high temperature, which descended

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upon it. The deoxydation and absorption of carbon, being facilitated, the metal contained a redundancy of carbon, notwithstanding a less quantity of fuel was consumed. It was probable that the want of strength, sometimes observed, might arise from the imperfect amalgamation of the carbon with the metal, and this would account for the strength being increased by remelting, particularly in the air furnace, wherein the process was more gradual than in the cupola. This gradual process was not desirable for cold-blast iron, in which the carbon was already well distributed; therefore, in almost all foundries, the air furnaces had been replaced by cupolas, as in the latter the iron was melted much more rapidly.

In answer to a question put by Mr. Farey, Mr. Rennie said that, in his experiments, the transverse strength was 750 lbs.; and when the bearings were 3 feet apart, the strength was 897 lbs. with specimens of good quality.

He believed that in some experiments on iron made with anthracite, published by Mr. Mushet in 1836, the cold-blast iron was shown to be from 16 to 27 per cent. stronger than that made by the hot-blast process. This might have arisen from peculiar circumstances, as Mr. Crane, of Ynischedwyn, had shown him a pig of hot-blast iron, which had resisted upwards of a hundred blows of a sledge hammer, while the ordinary cold-blast pigs were generally broken by about a dozen blows.

From the discrepancy shown by the various experiments, he was inclined to think that the knowledge of the real effects of heated air, in reducing metallic ores, was at present very limited.

Mr. Brunton said that the only place where iron had been made with anthracite and cold-blast, was at the Ystalyfera works, South Wales; and the report by Mr. Mushett, which had been alluded to, was upon the iron made there.

The black band iron-stone had recently been found at the Beaufort iron-works, South Wales; and as the furnaces were now blown with heated air, a large quantity of good soft iron was produced. That mine had been tried in the raw state, but the result had, he believed, been doubtful.

Mr. Davison submitted that the want of strength, which was complained of in the hot-blast iron, might in some degree arise from the use of raw coal instead of coke in the blast furnace, as the sulphur and other deleterious matters, which were formerly got rid of in the process of coking, were now introduced to the furnace, and probably combined with the iron.

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Mr. Vignoles agreed with Mr. Lowe, that the hygrometric state of the atmosphere had much influence on the quality of the iron produced. It was found, in India, that even with the rich hæmatite ores and charcoal, which were solely used by the native workers of metal, good iron could not be made when the air was charged with moisture, but that during the hot dry winds the best metal was produced.

Mr. Carpmael said, that during a recent visit to the Ystalyfera iron-works, he had tried some experiments on the strength of the iron then being made. The bars were 1 inch square, placed upon bearings 4 feet 6 inches apart, and were carefully and gradually weighted, the deflection being ascertained by an apparatus for the purpose.

No. 1 specimen, loaded with 588 lbs., deflected 1½ inch, and sprung back, when unloaded, without any permanent set. The weights were replaced, and additions made up to 690 lbs., at which point it broke.

No. 2 specimen, with 660 lbs., deflected 1½ inch; with 718 lbs. it deflected 1⅞ inch, and broke with 742 lbs.

No. 3 specimen, with 578 lbs., deflected 1 4-10ths of an inch; with 634 lbs., it deflected 1 5-10ths of an inch, and broke with 774 lbs.

Mr. Parkes remarked, with reference to the experiments upon wrought iron, that the test by blows of a hammer was not sufficiently substantive to be received as authority for the actual strength of iron; it frequently occurred in practice that bar iron, which when tried by breaking on an anvil, exhibited brittleness, after being forged by a smith, had proved tough and good. Neither did he conceive that the capability of a beam to sustain a given weight, suspended from its centre, was a proof of its fitness for resisting impact, torsion, and other strains to which machinery was subjected. On these grounds he did not receive the experiments either of Mr. Fairbairn or Mr. Mushet as satisfactory, or as true indications of the absolute strength of the iron.

A mode of testing should be introduced, which would show whether the improvements in making iron, affected the quality of the metal produced, or whether they were restricted to charges in the method of manufacturing.

Mr. May regretted that, upon a subject of such importance as the manufacture of cast iron and its capabilities, so little positive information was recorded. The field for scientific inquiry was very extensive, and although many men of high attainments had

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entered upon it, at present the results were not satisfactory: this, he believed, was only to be accounted for by the fact, that the habits of mathematical investigation of the experimenters, had led them to examine the theoretical rather than the practical part of the subject.

His experience of Scotch hot-blast iron, induced him to declare it deficient in strength and tenacity, but it did not follow that all hot-blast iron should be bad; on the contrary, he believed the process to be a great step in metallurgical science, from which important results would be obtained, but it had unfortunately afforded an opportunity for working up inferior materials, to the manifest detriment of the founder and the engineer.

Mr. Mackain objected to the commendation of Scotch hot-blast iron, as he had found much of it fit for general purposes, although it was not so strong as that made with cold-blast.

Mr. Ransome corroborated Mr. May's opinion of Scotch iron. It was so weak, that the pigs frequently broke in unloading; it was necessary to mix a large quantity of old iron with it, in order to give the castings for machinery the requisite amount of strength.

Mr. Nasmyth had used great quantities of Scotch iron, both for large and small castings, and could not rely upon it for machinery: it was deficient in strength, and the contraction of the metal, in cooling, was so great, as to cause frequent losses to the founders who employed it. Indeed, he conceived that nothing but the lowness of its price had caused it to be so extensively used; yet, in his opinion, this reduced commercial value marked its inferiority, for there must exist some good reason why hot-blast iron should only sell for 45*s*. to 50*s*. per ton, when cold-blast iron cost 80*s*. or 90*s*. He had for a long time used but little of it, and that only to mix with the harder qualities of iron.

He did not attach much faith to experiments tried upon bars of such small dimensions, and merely by suspending weights to them. He was of opinion that the masses of iron should be of larger dimensions, and that they should be tried under similar circumstances to those under which they were intended to be used.

Mr. Davison said that some years since, the framing for supporting one of the large vats at Messrs. Truman and Co.'s brewery, weighing 100 tons, when full, had been cast of cold-blast Welsh iron, and had stood well to the present time; but that, of a precisely similar set of castings made from Scotch iron, two girders had broken the first time the vat was filled.

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Mr. Field stated that the high character which had been obtained by the guns from the Carron Foundry, was to be, in a great measure, attributed to the care with which the iron employed was selected and mixed. A simple method was in use there for ascertaining the comparative strength of different qualities of iron, and had been found perfectly satisfactory for practical purposes.

A wrought-iron bar, 1 inch square, was bent into a deeply indented serpentine or zig-zag figure, having three or four bends, each end of the bar terminating in an eye. This was used as a pattern, from which several serpentines were cast at each running of the blast furnace: they were suspended by the upper eye, and a scale being attached to the lower one, weights were gradually added until the castings broke. Such a figure was fractured with very little weight, and the method did not afford any test of the actual strength of the metal; but it was simple, and as the foundry-men could conduct the experiment, it enabled a correct opinion to be formed of the comparative strength of the different kinds of iron under trial, and to make the necessary mixture.—The system was used in his foundry whenever new kinds of iron were purchased, and he obtained good results from it.

April 4th, 1843.

WILLIAM CUBITT, V.P., in the Chair.

No. 575. "On the Supply of Water to the City of Glasgow."

By D. Mackain, M. Inst., C. E.

THIS paper contains a history of the progressive increase of the Water-works of Glasgow, caused by the rapid extension of the city and its manufactories, derived from the documents in the archives of the Water Company, to which the author is the engineer.

The statement commences from the year 1755, at which time Mr. John Gibson, in his History of the City of Glasgow, expressed a desire for several improvements, among which he particularly mentioned a better supply of water, as although the population amounted to 23,000 persons, the water used by the inhabitants was drawn from the Clyde, from the several streams running through or skirting the city, and from wells in the streets. The water from the latter was unfit for domestic pur-

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poses, and the manufactories gradually extending on the sides of the burns, polluted their waters, and thus rendered a better general supply absolutely necessary. The various plans proposed in the year 1780, and subsequently, are then detailed; and as an instance of the low estimate then formed of the quantity of water required for a community amounting to about 43,000 persons, it is stated that the produce of a spring at Whitehill, which it was then proposed to convey to the city for its entire supply, is now found inadequate for the wants of a house of refuge for juvenile delinquents lately erected near it.

In describing the project of Mr. Henry Bell, for bringing water by a canal from the Falls of the Clyde, his reasons are given for rejecting the use of steam-engines. "These engines," he says, "are not only in themselves objectionable, in so far as they will be hurtful to the value of surrounding property, and a general nuisance to that part of the city or neighbourhood where they are erected; but the consumption of coals which will thereby be occasioned, will tend in no small degree to heighten the price of that fuel."

An account is given of the speculation of Mr. Harley, who erected pumps at Willow Bank, and forced the water through pipes into a reservoir in Upper Nile Street, whence it was carted through the town; its sale producing a revenue of about £4000 per annum.

At length a water company was formed, and Mr. Telford was requested to report upon the proposed plans, all of which he found objectionable, and recommended that steam-engines should be placed on the banks of the Clyde, at a spot about two miles up the river, with the necessary reservoirs, filters, &c., and that the water should be forced by pumps into the city. He estimated that the quantity of water required for a population of 80,000 persons, would be about 500 gallons per minute; that, including manufactories, the renters would be about equal to 6000 families; and that the average rent upon that number would be £2 per family, which would produce £12,000 per annum. Acting upon this report, in the year 1806 the company ordered from Messrs. Boulton and Watt two engines with cylinders of 36 inches diameter, and laid pipes of 14 inches diameter, to a reservoir on the spot, then called the Gallow Muir: from this small commencement sprung the present extensive works, whose gradual increase is carefully traced in the paper, until the enumeration of its actual position in 1842, when the

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population of the city exceeded 300,000 persons, and the annual income was about £30,500, making the average payment about nine shillings per annum for each family. The works had increased, until they consisted of thirteen steam-engines, of various powers, with their filters, reservoirs, &c., an accurate account of which is promised in a future communication.

In this history many statistical details are given, obtained from the archives of the company; and the difficulties encountered by the engineers, who preceded the author in the management of the works, are clearly described.

The details of the various oppositions from local interests, the several Acts of Parliament, the fluctuation of the mercantile value of the shares, the history of the Cranston-hill Water-works, formed by a rival company, with whom for a time a ruinous competition existed, and whose works it became necessary to purchase, are given at length. The paper then describes the natural filter for the water, which was taken advantage of, by driving tunnels along the borders of the peninsula round which the Clyde sweeps in the form of a horse-shoe. This spot being composed of sand and gravel, would, it was argued, form a filter, whence the water could be pumped up and conveyed across the river into the city. Many plans were designed for thus carrying the water; that which was adopted was suggested by Mr. Watt; he proposed the use of cast-iron pipes, fitted, where necessary, with revolving ball and socket joints, which he then first introduced, and of which he sent a wooden model to the company, which model was now presented by them to the Institution of Civil Engineers. These pipes adapted themselves to the form of the bed of the river, and the plan was perfectly successful.

Mr. Telford's experiments upon stone pipes are mentioned, and some results are given. A stone from Rutherglen White quarry, 4 feet 9 inches long, 18½ inches square, with a bore in it 9½ inches diameter, when subjected to a pressure of a column of water from 60 to 80 feet in height, split in the direction of the natural bed. Another stone from the same quarry, 5 feet 2 inches long, 13 inches square, with a bore of 4½ inches diameter in it, did not emit any water until the pressure amounted to 100 feet head; after that it discharged water freely, and split when the column a little exceeded 300 feet. A Portland stone, 4 feet 6 inches long, 12 inches diameter, with a bore of six inches diameter in it, did not emit any water, nor was there any sympton of fracture under a pressure of 350 feet. Other stone pipes were also experimented

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upon with such various results, that Mr. Telford arrived at the conclusion, that they could not be relied upon, and accordingly recommended iron pipes.

The paper is illustrated by a large map of the city of Glasgow, upon which is shown by different tints, the houses which existed when the water-works were commenced, the ranges of distribution, and the extent of the district for which the company is bound by Act of Parliament to supply water for certain periods during each day.

Mr. Simpson said that he was well acquainted with the works which had been described, as he had repeatedly visited them professionally; there were many points of interest attached to them, and the engineering operations were of considerable magnitude and importance. The late Mr. Watt suggested the idea of using the sandy peninsula on the opposite side of the river Clyde, to the present works of the Glasgow company at Dalmarnock, as a natural filter, and it succeeded admirably, until the immoderate quantity of water was delivered to the city during the competition with the Cranston Hill Water Company. Of this spot, and the tunnels and wells in it, he presented a tracing. When he was at the works in the year 1833, Mr. Alexander Anderson, the then resident engineer, had been pumping water on to the peninsula for many months, and the deficiency of the natural filters (nearly half the supply at the time) was made up by that means; at first the pumps were worked by rocking shafts, connected to the engines across the river; afterwards pumps were erected close to the engines, and the water conveyed arross the river through pipes. A very large portion of the supply to the inhabitants was drawn from the mains, without the intervention of cisterns, and a great deal of the water was thus wasted.

The filter recommended by Mr. Telford was composed of a series of cells filled with sand, the water passing through them in succession; this filter was not effective during floods, or when the water of the Clyde held in suspension the coloring matter from the peat-mosses; after passing through the first cell little more was accomplished, and the water continued discoloured.

Mr. Simpson had, however, seen the Clyde water filtered until it was perfectly bright, by conducting the process very slowly, the rate of motion not exceeding half an inch per hour through the medium—precipitation on the sand evidently took place; he

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had, in some instances, accelerated the precipitation by previous admixture of alumina or pipeclay and other materials, and had succeeded in throwing down the coloring matter, so that the filters produced perfectly pellucid water. In a filtering bed, properly arranged, the impurities were arrested at and near the planes of ingress,—great extents of medium effected little in addition. In some filters which had been worked for nearly sixteen years, it had not been found necessary during that period to change the entire mass of materials.

The natural filters of the Glasgow company hadbeeninjuriously affected by depressing the water in the wells, thereby increasing the pressure of the water on the bed and the foreshores of the river, and thus bringing the particles of the medium into too close contact, and forcing obstructions between them.

The Glasgow Water-works was an example of the employment of the largest steam-engine power for water-works purposes in Britain; he believed that, at one period, the engines at the works were equal to nearly 700 horses power.

During the erection, in 1829, of the second pair of engines, with cylinders of 54 inches diameter, many difficulties were encountered; in the Vale of the Clyde, large quantities of mud, almost in a fluid state, lie intermixed with the strata. In sinking the wells for these engines, the mud was met with much nearer the surface than was anticipated, and when tapped, it rose up like a fountain in the bottom of the well; the pumps were, in consequence, fixed at a higher level than was originally designed. Mr. Crichton, of Soho, was of opinion that the alteration of 4 feet 5 inches in the level of the pumps was immaterial; he probably did not calculate upon the water sinking in the filter-wells when the increased pumping power was applied.

Mr. John Gibb, of Aberdeen, who was consulted about the foundation, bored to 30 feet lower than the bottom of the new well, and found that the ground became weaker as the depth increased, so that any attempt to sink the well, to the depth required, would be very hazardous. He therefore advised the enlargement of the surface of the building under the whole superstructure, with due provision for the weights and strains in the arrangements,—that a strong platform should be constructed of Memel logs and planking for the foundation, and the spaces between the timber to be filled in with masonry, flushed in and grouted: this plan was adopted, and proved successful as a foundation; but the depth was insufficient, and the working barrels of the pumps

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were obliged to be fixed so much above the level of the filters, that they ceased to fill when the water in the tunnels was depressed 22 feet below the tops of the pumps. This was a serious disappointment to the company, for whenever the water in the river was low, a corresponding depression occurred in the wells of the filters; and in general, for many hours daily, these two engines only raised as much water as one would have pumped, if the working barrels had been fixed at the proper level. The suction-pipes were inclined towards the filter wells, and the pumps were distant from them about 110 yards; this, Mr. Simpson considered, was comparatively of little importance, as he had worked pumps with horizontal suction-pipes 500 yards in length.

Mr. Hawkins recommended slow filtering, without pressure: some years since he had been engaged in refining sugar by Howard's process, by which the syrup was applied to the filter under a column of 20 feet in height; out of a certain quantity, 300 gallons were returned unfiltered, and by the time 60 gallons had been clarified, the filter was choked. He reduced the column to 2 feet, and out of the same quantity, 6 gallons alone were returned, while 300 gallons were clearly filtered; this, and numerous other cases, had convinced him that pressure was injurious to filtration,

Mr. Braithwate believed, that although slow filtration was generally preferable, yet that the velocity must depend upon the quality as well as the quantity of matter held in suspension; this consideration would also regulate the time during which the filter could be worked without cleansing.

Mr. Hawkins found practically, that half an inch in depth was the utmost that was required to be removed from the surface of the filtering medium, when it was cleaned and renewed.

Mr. Simpson said, that in order to filter properly, there should be extensive reservoirs where all the grosser particles could subside, or be arrested previously to arriving at the filtering medium; with due attention to this point he had seen filtering beds worked for sixty-seven days consecutively without requiring to be cleansed.

PHYSICAL SCIENCE IN ENGLAND.

THAT man who can contemplate the changes which are continually occurring in the world, without perceiving the working of a moral revolution in the thoughts and actions of mankind, must be men-

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tally blind, for it is most palpable, that what was once thought valiant would now be branded as cruelty; and pursuits, which are now looked upon as honorable, would, not long since, have been considered unworthy the attention of the educated and refined. The wealth which has been brought into this country by the development of talents peculiar to the present century, has, in a great measure, effected this change, and even the noble of the land have not scrupled, both by their abilities and capital, to assist the growth of that mighty revolutionizer MECHANICAL POWER. Many persons, when considering this subject, have been so alarmed at the extensive capabilities of machinery, that not knowing where invention was to end, they have seriously proposed to crush it in the bud, rather than let such a monster power stalk through the earth remodelling trades, amalgamating classes, destroying prejudices, and bringing to the cottage of the peasant and the hut of the savage—comforts which were once considered the luxuries of the great. These persons, we need scarcely say, were for the most part weak and foolish, but the opinion was not exclusively confined to them, as many well read and thinking persons cannot yet see the benefit derived from the application of the laws of nature to the use of man. Very different, however, was the opinion of our government on this subject, when a prohibition was set on the exportation of machinery, least other nations should rival the manufactures of this country; and though that policy has not succeeded, the government must not be condemned, as, arguing from analogy, they would naturally suppose that prohibition would have the desired effect. But the advantages to be derived from machinery were too palpable to be overlooked, and too great to be neglected by neighbouring nations, although rigorous restrictions were imposed: hence the invitations to English engineers and workmen from all parts of Europe, in order to establish machine shops and factories of every description abroad. The progress of improvement in mechanical skill has been silently effected, and, like the fertilizing Nile, rising from a scarcely perceptible source—expanding while advancing—spread over the surrounding country, carrying with it the blessings of fruitfulness and prosperity. Seldom has public attention been drawn to this branch of the arts, except by some vagaries and chimerical propositions, which have occasionally been thrust forth to notice. One or two periodicals, devoted exclusively to the reporting of new discoveries, have been the silent chroniclers and guides to the whole class of inventors. These

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works have been for many years the only printed sources whereby the world might know that such improvements were really in existence, but now we have a work of high literary reputation finding room in its pages for a notice of this hitherto neglected subject. An article on "Physical Science in England," published in the October number of *Blackwood's Magazine*, deserves some comment, not so much from the truthfulness or ability of the remarks contained therein, as from the prominent position of the vehicle by which it is introduced to the public. The writer commences by measuring the merits of Alexander with Archimedes, and of Napoleon with James Watt, and comes to Lord Bacon's conclusion, that "the introduction of noble inventions seems to hold by far the most excellent place among all human actions." He then proceeds, in rather a pedantic manner, to lament the want of education in persons engaged in this "noble" pursuit:—

"Unfortunately, the fact of experimental science being rejected by the educated classes and thrown in a great measure upon the artizans of a country, has conduced, among other evils, to one of a most detrimental character; viz., the want of accuracy in scientific language, and consequently the want of accuracy in ideas. Perfection in language, as in every thing else, is not to be attained, and doubtless there are few of the most highly educated who would not, in many cases, assign different meanings to the same word; but if some confusion on this subject is unavoidable, how much is that confusion increased, as regards scientific subjects, by the mass of memoirs written by parties, who, however acute their mental perceptions may be, yet, from want of early education, do not assign to words that accuracy of signification, and do not possess that perspicuity of style, which is absolutely necessary for the communication of ideas! Those, therefore, who, with different notions of language, read the writings of such as we are alluding to, either fail to attach to them any definite meaning, or attach one different from that which the authors intended to convey; whence arises a want of reciprocal intelligence, a want of unity of thought and purpose."

We must plead ignorance as to what branch of experimental science the writer is alluding, unless it be chemistry; but in that the difficulty arises merely from men of learning and experience, changing the names of substances when they have been found to contain properties hitherto unknown, in order that they shall express the presence of such properties. Mechanics cannot be subjected to a similar inconvenience, for words are in many cases scarcely necessary to the understanding of an invention, where

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proper drawings are given. The ideas of the writer on the Patent Law will be seen by the following quotations :—

" Among the various circumstances which influence the progress of physical science in this country, one of the most prominent is the *Patent* law—a law in its intention beneficient; but whether the practical working of it be useful, either to science or its cultivators, is a matter of grave doubt. Of the greater number of patents enrolled in that depôt of practical science, Chancery Lane, by far the majority are beneficial only to the revenue; and on the question of public economy, whether or not the price paid by miscalculating ingenuity is a fair and politic source of revenue, we shall not enter; but on the reasons which lead so many to be dupes of their own self-esteem, a few words may not be misspent. The chief reason why a vast number of patents are unsuccessful, is, that it takes a long time (longer generally than fourteen years, the statutable limit of patent grants) to make the workmen of a country familiar with a new manufacture. A party, therefore, who proposes patenting an invention, and who sits down and calculates the value of the material, the time necessary for its manufacture, and other essential data; comparing these with the price at which it can be sold to obtain a remunerative profit, seldom takes into consideration the time necessary, first, to accustom the journeymen-workers to its construction, and secondly, to make known to the public its real value."

The truth of this "chief reason" our experience denies; and, as an instance of the aptitude of workmen to seize upon and carry out a new idea, we can point to a circumstance which, a short time since, fell under our immediate observation :—A new fabric, made on a lace machine in France, was shewn to a Nottingham lace-maker, and orders were given him to adapt machinery, so as to produce the same description of article, which was satisfactorily effected within a fortnight, without his possessing any clue to the original invention, further than what a very imperfect drawing could communicate. To proceed :—

" In the present universal competition, puffing is carried on to such an extent, that, to give a fair chance of success, not only must the first expense of a patent be incurred—no inconsiderable one either, even supposing the patentee fortunate enough to escape litigation—but a large sum of money must be invested in advertisements, with little immediate return; hence it is that the most valuable patents, viewed in relation to their scientific importance, their ultimate public benefit, and the merits of their inventors, are seldom the most lucrative, while a patent ink-stand, a boot-heel, a shaving-case, or a button, become rapidly a source of no inconsiderable profit. Is this beneficial to inventors? Is it an encouragement of science, or a proper object of legislative pro-

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vision, that the improver of the most trivial mechanical application should be carefully protected, while those who open the hidden sources of myriads of patents, are unrewarded, and incapable of remunerating themselves? We seriously incline to think that, as the matter at present stands, an entire erasure from the statute books of patent provision would be of service to science, and perhaps to the community; each tradesman would depend for success upon his own activity, and the perfection he could give his manufacture; and the scientific searcher after experimental truths would not find his path barred by prohibitions from speculative empirics."

That the "scientific searcher" should be baulked in appropriating ingenious ideas, which have, of late, been considered the property of those from whom they emanated, is grievously to be deplored. Would it not be advisable to petition Parliament on this subject, as the attention which has been given of late to the granting of copyrights, shews a disposition, on the part of that body, to listen to the complaints of the oppressed?

"According to the present patent laws, it is more than questionable whether the discoverer of a great scientific principle could pursue his own discovery, or whether he would not be arrested on the threshold by a subsequent patentee; if Jacobi lived in constitutional England instead of despotic Russia, it is doubtful if he could work out his discovery of the electrotype—we say *doubtful;* for, as far as we can learn, it seems hitherto judicially undecided whether the mere use of a patent, not for sale or a lucrative object, is such a use within the statute of James as would be an infringement of a patentee's rights."

We agree with the writer, that it is doubtful if Jacobi could work out his discovery in England; he would, most probably, be satisfied that the applicability of the electrotype is so well understood, and so earnestly pursued, that little else of novelty may be expected. A better feeling would have been shewn, by substituting "Spencer" for "Jacobi," as even if the discoverer were Jacobi, it has been clearly proved, that Spencer—an Englishman—has equal right to the honor. The writer proceeds:—

"It appears to be settled, that a previous experimental and unpublished use by one party, does not prevent another subsequent inventor of the same process from patenting it; and, by parity of reasoning, we should say, that if a party have the advantage of patenting an invention which can be found to have been previously used, but not for sale, he should not have the additional privilege of prohibiting the same party, or others, from proceeding with their experiments. There are, however, not

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wanting arguments for the other view. The practice of a patented invention, for one's own benefit or pleasure, deprives the patentee of a possible source of profit; for it cannot be said that the party experimenting, if prohibited, might not apply for a license to the patentee. Take, for instance, the notorious and justly censured patent of Daguerre. Supposing, for argument's sake, this patent to be valid, can a private individual, under the existing patent laws, take photographic views or portraits for his own amusement, or in pursuance of scientific investigations? If he cannot, then is an exquisitely beautiful path of physics to be shut up for fourteen years; or if he can, then is the licensee, a purchaser for value, to be excluded from very many sources of pecuniary emolument?"

The "notorious and justly censured patent of Daguerre," we beg to assure the writer has been admitted by the highest tribunal in the kingdom to be perfectly valid; for an answer to his queries, we refer him to Mr. Claudet, of the Adelaide Gallery, who will readily furnish both apparatus and information for taking photographic views, "in pursuance of scientific investigations."

After delivering himself of these opinions, which would imply, that ingenuity has been crippled, and the advance of science in England impeded by the working of the patent law, the reviewer might be expected to give a sketch of the probable position they would have held, had such disadvantages not been present, and to point, as an example, to a country more wisely governed, and, consequently, more flourishing in the Arts: but this, although it would have gone far to confirm others in his opinion, has for the present been omitted. To those who are acquainted with the source from which the most important discoveries and inventions have emanated, the following may be a novelty, as regards the rank each nation holds as the promoter of physical science:—

"In experimental and theoretical Physics, we should be inclined to place the German nations in the first rank; in pure and applied mathematics, France. The former nations far excell all others in the independence and impartiality with which they view scientific results; researches of any value, from whatever part of the world they emanate, instantly find a place in their periodicals; and they generally estimate more justly the relative value of different discoveries than any other European nation; the æsthetical power which enables them to seize and appreciate what is beautiful in art, gives them perception and discrimination in science; but they are not great as originators. The French, notwithstanding the high pitch at which they have undoubtedly arrived in mathematical investigation, notwithstanding the general accuracy of their experimental researches, have more of the

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pedantry of science; their papers are too professional—too much *selon les régles*; there are too many minutiæ; the reader is tempted to exclaim with Jacques—'I think of as many matters as he; but I give Heaven thanks, and make no boast of them.' Their accuracy frequently degenerates into affectation and parade. *

* * * * *

"England, which we should place next, is by no means exempt from these trappings of science. Many English scientific papers seem written as if with the resolute purpose of filling a certain number of pages; and many of their writers seem to think a *paper per annum*, good or bad, necessary to indicate their philosophical existence. They write, not because they have made a discovery, but because their period of hybernation has expired. Still, in England, there is a strong vein of original thought. Competition, if it lead to puffing and quackery, yet stimulates the perceptions; and, in England, competition has done its worst and its best: in original chemical discovery, England has latterly been unrivalled.

"Next to England we should place Sweden and Denmark—for their population they have done much, and done it well; then Italy—in Italy science is well organized, and the rulers of her petty states seem to feel a proper emulation in promoting scientific merit—in which laudable rivalry the Archduke of Tuscany deserves honourable mention; America and Russia come next—the former state is zealous, ready at practical application, and promises much for the future, but as yet has not done enough in original research to entitle her to be placed in the van. Russia at present possesses few, if any, native philosophers—her discoverers and discoveries are all imported; but the Emperor's zeal and *patronage* (a word which we scarcely like to apply to science) is doing much to organize her forces, and the mercenary troops may impart vigour, and induce discipline into the national body."

The erroneous statements contained in these several extracts must be attributed solely to an imperfect information on the subject: but the spirit in which many of the remarks are conceived, reflect great credit upon the writer, being, as he is, the first to draw the attention of literary persons to the advancing strides of science; indeed, the appearance of such a paper in *Blackwood*, is another sign that honor will, ere long, alike await the hero who shall conquer the elements, and make them subservient to the use of man—as the warrior who humbles the haughty foe, or the statesman who protects the liberties and conduces to the prosperity of the people.

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POPULAR CYCLOPÆDIA OF NATURAL SCIENCE.

SECOND NOTICE.

We have now before us Parts V. and VI. of the Cyclopædia of Natural Science,* which treat of Animal Physiology. Although necessarily a subject of great complexity, the author has, by a judicious arrangement and separate consideration of the different functions,—tracing them from the lower animals to their more perfect development in man,—rendered the work both easy to be understood and of interest to the student.

This treatise is not merely a compilation of facts, but reasons are given for the existence of the various phenomena as they are explained, or, where conclusions cannot be satisfactorily made, the shrewdest conjectures which have been formed on the subject are laid before the reader. The illustrations are copiously dispersed throughout, and some of them may bear envious comparison with the best wood engravings that have yet appeared; the method of combining the skeleton with the outward configuration of the animal, has struck us as both novel and judicious.

ON THE LAWS RELATING TO LETTERS PATENT FOR INVENTIONS.

THE PATENT LAWS OF SARDINIA.

No. IX.

The legislative enactments in force in Sardinia, relative to patents for inventions, consist of a royal decree of 28th February, 1826; and a further decree, dated 2nd June, 1829. Previous to the promulgation of these decrees, patents for inventions or discoveries were granted, upon special application being made to the King; but there does not appear to have been any fundamental law for the purpose of regulating the issue of such grants, or the conditions on which they were obtained, previous to 1826.

In Sardinia, like some other continental countries, the Government reserve the right of granting or refusing a patent for any invention or discovery, as may be thought most likely to conduce, ultimately, to the public welfare. If the Government should consider that an invention, for which a patent is requested, is not

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* W. S. Orr, & Co., Paternoster Row.

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worthy of, or of sufficient importance for a patent, the application will be refused: as the grant of a patent is looked upon as a kind of reward for distinguished merit, and is not to be given without due consideration. If a patent is refused, and the invention yet appears to possess some merit, the Government sometimes reward the applicant in another manner. The following is a translation of the decrees above referred to:—

Royal Decree, bearing date the 28th day of February, 1826, by which His Majesty orders certain Regulations in reference to exclusive privileges.

CHARLES FELIX, by the grace of God, King of Sardinia, Cyprus and Jerusalem, &c.—We are informed, that, among the persons we have honored and encouraged, by granting them exclusive privileges, there are some who altogether neglect, or at any rate delay beyond any reasonable time, exercising the inventions or machines, or putting in practice the manufactures for which they have obtained a privilege or monopoly; and that, in consequence, the general industry of the country does not derive any benefit from the protection and favour which we have granted, and do grant, to the authors of useful discoveries, to those who make improvements thereon, and to those who first introduce into our States inventions which are protected in foreign countries. It has therefore appeared necessary to us to order or decree, and enforce certain measures, whereby (while continuing to effectually protect the inventors and importers of any useful art or manufacture) native industry shall not be liable to suffer from the negligence above mentioned. We have, consequently, of our sovereign authority, and under the advice of our council, ordered, and do order, as follows:—

ART. 1. The authors of any discovery or improvement in any branch of industry, the importers or introducers into our States of useful foreign inventions, and the authors or editors of such works as shall be considered as worthy, are the only persons who can obtain privileges or patents.

We reserve to ourselves the right of rewarding, in another manner, the inventors or importers of discoveries, which, although useful and advantageous, may not be considered as sufficiently important to merit the favour of a patent; provided, however, that such inventions or discoveries are deemed worthy of such other and minor reward.

ART. 2. Patents shall be granted for a fixed and certain length

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of time. Their duration shall commence from the date of the grant of the patent; but the privileges, arising from the latter, shall not come into force, or have any public effect, until the grant is officially published and advertised.

ART. 3. All applications to obtain patents shall be addressed to us through the medium of our Secretary of State for Home Affairs. The application shall specify the description of invention or discovery; and also the length of time for which the patent is requested, as well as the place where the invention is to be put in practice. All applications must be accompanied with models, drawings, figures, and such a specification or description as will be sufficient to explain the invention in a complete, clear, and satisfactory manner.

ART. 4. When the letters-patent are granted, the models, drawings, figures, and description, above mentioned, shall be sent to our Academy of Sciences, at Turin, where they are to be deposited, and shall remain.

ART. 5. The magistrates, presidents of commerce, and all bodies, who, in the course of their duty, shall find it necessary to examine them, are empowered to require the descriptions or specifications to be opened for their examination.

ART. 6. A certain time within which the invention, forming the subject of the patent, must be put to work, shall be appointed and mentioned in every patent.

ART. 7. When a patent is granted for the whole extent of the State, it shall be registered at all the consulates and tribunals of commerce; but when the patent is limited to a certain part or district of the country, it shall only be registered at the Consulate of Turin, and at the consulate or tribunal of commerce of that particular district for which it is granted. Furthermore, all patents, giving any exclusive rights or privileges, must be published in the places for which they are granted, and according to regular and appointed forms, within the space of three months from their date, otherwise they will be without effect.

ART. 8. Those persons who shall hereafter obtain a patent, must give proof before the Consulate of Turin, and also before the consulate or tribunal of commerce of the district for which their invention is patented, that they have put it in practice within the time specified in the letters-patent.

ART. 9. Those persons who, before the date of these presents, shall have obtained a privilege, and which has not yet expired, must, within the space of three months, conform to the conditions prescribed in Article 7, and 8.

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ART. 10. The assignees or representatives of a patentee must every year appear before the consulate or tribunal of commerce of the district, and also before the Consulate of Turin, and prove that they continue to use and practise the particular branch of industry for which they have obtained the patent; and, moreover, if the patent is for some article of manufacture, they must present and deposit, at our Academy of Sciences, a specimen of the work done, or articles made, during the preceding year.

ART. 11. When the product of any art or manufacture, which is patented, shall be found inferior, the Academy of Sciences, at Turin, shall inform the Secretary of State for the Interior thereof, and, in that case, if the patent extends over the whole kingdom, the minister shall also give notice thereof to the Consulate of Turin, in order that this tribunal may pronounce the repeal of the patent. If the patent should be limited to a part of the country, notice shall be given, for the same purpose, to the consulate, or to the tribunal of commerce of the district, taking care that the Consulate of Turin is also informed.

ART. 12. The Consulate of Turin, and the consulates and tribunals of commerce for the district for which the patent is granted, shall regularly give notice to the department of the interior, if the assignees or representatives have or have not complied with the conditions prescribed by the patent.

Those inventors who shall not have satisfied the tribunals, or fulfilled the conditions prescribed by Articles 7, 8, 9, and 10, shall be deprived of their patent.

ART. 13. At the expiration of the term of patents, and whenever assignees or others are deprived of their rights, the Consulate of Turin shall give public notice thereof, by publishing it officially; and any person can thenceforth freely use or exercise the patented invention. When the patent shall have been granted for only a part of the kingdom, a particular and local publication shall be made by the consulate or tribunal of commerce of the district for which the patent shall have been granted, as well as by the Consulate of Turin. These publications or advertisements shall always be inserted in the Piedmontese Gazette.

ART. 14. The consulates and tribunals of commerce are specially ordered to take care that no fraud or infringement takes place, to the detriment of those who shall have obtained patents.

ART. 15. Our Academy of Sciences, at Turin, shall publish a list of all the patents that are granted; the subject and duration of these patents shall also be mentioned therein. The Academy

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is also charged with the publication of all patents that have expired, and this publication shall comprise the description of the inventions, with the figures and drawings necessary for the perfect explanation of the same.

ART. 16. The date of the publication of these patents shall be fixed by our First Secretary of State for the Interior, who shall also point out the best means of liquidating the expenses which may be required for the before-mentioned object.

ART. 17. All transfers and assignments of patents shall be invalid, unless they are previously approved of by us; and, in this case, the patent, which shall have been the subject of the transfer or assignment, shall be immediately considered as revoked.

ART. 18. We further declare, that the authors of books, or drawings, which shall be published in our States, in conformity with the laws and regulations in force, with reference to the press, shall be exempt from the preceding conditions. We are willing that they should enjoy the exclusive right of printing and selling their works for a period of fifteen years, provided they shall have made a declaration, expressing their wish to take advantage of this right; and upon condition that, before any publication or issue of the work, they shall have deposited a copy thereof with the Secretary for the Department of the Interior, and one in each of the libraries of the University of Turin, of our Academy of Sciences, and of our Archives of the Court.

We hereby order all men to observe, and cause to be observed, these presents; and the magistrates of the consulate of Turin are required to register the same; and all copies of this decree, that are printed at the Royal Printing Office, shall be considered as authentic.

Given at Turin, the 28th day of February, in the year 1826, and in the sixth year of our reign.

CHARLES FELIX.

Royal Decree, by which His Majesty extends, for three months, the term fixed by Art. 7, of the Royal Decree of 28th February, 1826, for the Registration and Publication of Letters Patent, and by which some other arrangements and regulations of the same decree are also modified.

CHARLES FELIX, by the grace of God, King of Sardinia, Cyprus, Jerusalem, &c. &c.—Although it is our firm determination not to

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grant patents to any other persons than those mentioned in Art. 1, of our decree of the 28th February, 1826, and unless the subjects appear, by their manifest utility, to be really worthy; we also wish, on the other hand, that those who have already obtained the grant of a patent, may be able, more easily, to preserve and enjoy the same. For this purpose, we have deemed it advisable to prolong the time fixed for the registration and publication of these patents, and at the same time to modify some other parts of the same decree.

We have consequently, by these presents, of our sovereign will, and with the advice of our council, ordered and decreed as follows:—

ART. 1. The term of three months, fixed by Article 7, of our decree of. 28th February, 1826, for the registration and publication of letters-patent, is hereby extended to six months, from the date of the grant of the patent.

ART. 2. The grant of letters-patent shall not, for the future, be registered at the tribunals of commerce for the Duchy of Genoa. Henceforth it shall be sufficient for them to be registered by the Senate of Genoa, and the Consulates of Turin, Chambery, and Nice, according to whether the patents extend to the whole of our States, or are limited to these respective parts of the kingdom.

ART. 3. The grant of letters-patent shall be published only in the chief places of the provinces, and shall be binding in all the communes which belong to them.

ART. 4. The proofs and notice, which are spoken of in Articles 8, 10, and 11, of our decree above mentioned, shall only be furnished to the Senate of Genoa, and to the Consulates above mentioned, who shall immediately transmit, to our Department of the Interior, the information required in Article 12, which follows.

ART. 5. Those persons who, since the publication of the manifesto of the Consulate of Turin, dated 6th of March last, shall have obtained the grant of some patent, or a prolongation of a patent, the expiration of which has been published in the said manifesto, and who shall not, at the present time, have accomplished all the formalities of registration and publication, prescribed by our decree of 1826, are hereby allowed a further space of time, namely, to the end of next April, to conform to the regulations of the present decree, without prejudice however to the rights of a third party, acquired before the publication of these presents.

ART. 6. All the other arrangements or regulations contained

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in our decree of 1826, and which are not specially mentioned in these presents, shall remain as they were before.

Given at Turin, the 2nd June, 1829, and in the ninth year of our reign.

CHARLES FELIX.

List of Disclaimers
OF PARTS OF INVENTIONS AND Amendments
MADE UNDER LORD BROUGHAM'S ACT.

James Johnston, Esq.,—disclaimer and memorandum of alteration to patent dated 5th May, 1843, for "improvements in the construction of steam-boilers and machinery for propelling vessels." Filed 20th October, 1843.*

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

Sept. 27. *Paul Moore*, of Birmingham, for an improved stop butt hinge.

28. *Messrs. Attwood, Wimble*, and *Warner*, of Lewes, Sussex, for a churn.

28. *James Stewart*, of Gloucester Crescent, Gloucester Gate, Regent's Park, for a scroll fastener for brooches, &c.

30. *Messrs. Insole* and *Jones*, Hurst-street, Birmingham, for an improved clog fastening.

Oct. 2. *John George Rowley*, of 108, Hatton Garden, Holborn, Middlesex, for a self-binder or utility clasp.

3. *Messrs. Merry & Co.* of Birmingham, for a letter clip.

3. *William Henry Cherry*, of Northampton, for a water-closet.

3. *Thomas Warne*, of Henrietta-street, Covent Garden, for an improved antigropelos.

4. *Henry Curzon*, of Kidderminster, for a horse-power machine.

6. *John Mather*, of 3, Heathfield-place, Nine Elms, Vauxhall, for a toe-piece for boot and shoe lasts.

* By this disclaimer the words, "and machinery for propelling vessels," are erased from the title of the patent.

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10. *George Jones*, of Lionel Street Foundry, Birmingham, for an exhauster or blower of gas and air.
10. *Henry Powell*, of 102, New Bond-street, in the parish St. George's, Middlesex, for a new night-cap.
12. *Edmund George Hummel*, of St. James's-street, London, for an air-tight bed and chamber-pan.
12. *Charles Lewis & Co.*, of Stangate-street, Lambeth, for an omnidirective shower bath.
12. *Charles Topham* and *Edmund Alderson Fawcett*, of Derby, for a glove, with cuff attached.
14. *John Johnston*, of 30, London Wall, City, for an improved churn.
16. *Joseph Brook Shires*, of Newton-street, Manchester, for an iron shoe or tip for roving-cans.
16. *James Heath*, of Broad-street, parish of St. Michael's, Bath, for a new head or hood of a Bath wheel chair.
16. *Daniel Ferguson*, of Kilkenny, for a propelling apparatus.
17. *George Stubs*, of Warrington, Lancashire, for a window blind or roller map tackle.
18. *William Healy*, of the firm of *James Burbidge* and *William Healy*, 130, Fleet-street, London, for a boiler, in case.
20. *George Orpwood*, of 82, Bishopsgate-street, City, for a coffee roaster.
20. *John Maur Rumley*, of Monkwearmouth, Sunderland, for a windlass.
21. *James Ward* and *William Colbourn*, of Stratford-upon-Avon, Warwickshire, for a guillotine chaff-cutting engine.
23. *James Richmond*, of Salford, for an improved machine for cutting hay and straw.
24. *Benjamin Lisle*, of Church-street, Chelsea, for a work-frame, for Berlin and other description of figure work.
24. *William Cook*, of Redcross-street, for an improved cock or tap for baths and washing tables.
25. *Messrs. Perry*, of New Bond-street, for a ring lamp.
25. *Joseph Taylor*, of 55, Southampton-street, Pentonville, for a fire-escape.

Notwithstanding there appear, in the above list, several mechanical constructions or machines, we beg the public to particularly observe, that the Act, under which they have been registered, affords no protection whatever to such inventions.—[Ed.

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List of Patents

Granted by the French Government from the 1st of January to the 31st of March, 1841.

(Continued from Page 233, Vol. XXIII.)

Guerdon, of La Chapelle-Yvon, for a machine for heckling flax.

Guille, Bondy, and Lefèvre, of St. Quentin, for an improved tissue.

Hurez, of Paris, for a new califyer.

Laborde, (Mad^e.,) of Paris, for scales for domestic purposes.

Laignel, of Paris, for improvements in navigation.

Lan and Co., of Belleville, for a new cigar holder.

Madol, of Paris, for improvements in combing and carding wool.

Loisel, of Paris, for a process for melting tallow.

Malepeyre, for a new coffee-pot.

Manon and Perret, for a new button.

Mazeline Brothers, of Havre, for a new mill for grinding sugar-cane.

Mealares, of Privas, for an instrument for cutting the leaves for feeding silk-worms.

Mongodin, of Paris, for a new pump.

Monier, of Paris, for a new pump.

Montenon and Jacomy, of Paris, for a new pump.

Moret, of Paris, for an improved syringe.

[*To be continued.*

List of Patents

That have passed the Great Seal of IRELAND, from the 17th August, 1843, to the 17th of October, 1843, inclusive.

To Edward Morewood, of Thornbridge, in the county of Derby, merchant, and George Rogers, of Chelsea, in the county of Middlesex, Gent., for improved processes for coating metals.—Sealed 25th August.

Thomas Clarendon, of 101, Great Brunswick-street, in the county of the city of Dublin, for an improved method of shoeing horses,—being a communication.—Sealed 4th September.

Martyn John Roberts, of Brynycaeran, in the county of Carmarthen, Gent., for certain improvements in machinery for pre-

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paring, spinning, and winding wool, cotton, flax, silk, or any other fibrous bodies.—Sealed 4th September.

Joseph Daniel Davidge, of Greville-street, Hatton Garden, in the parish of St. Andrew, Holborn, and county of Middlesex, machinist, for improvements in manufacturing certain materials as substitutes for whalebone, applicable to various useful purposes,—and in the machinery for effecting the same.—Sealed 14th September.

Fennal Allman, of No. 9, Salisbury-street, in the county of Middlesex, surveyor, for certain improvements in apparatus for the production and diffusion of light.—Sealed 28th September.

John Ainslie, of Redheugh, near Dalkeith, in North Britain, farmer, for certain improvements in the manufacture of tiles, bricks, retorts, and articles made from clay and other plastic substances; and in the apparatus and arrangements for such manufacture.—Sealed 3rd October.

Charles Maurice Elizee Sautter, of Austin Friars, in the city of London, Gent., for improvements in the manufacture of borax; being a communication from abroad.—Sealed 4th October.

Richard Laming, of Radley's Hotel, New Bridge-street, Blackfriars, in the city of London, Gent., for certain improvements in the purification and application of ammonia, to obtain certain chemical products.—Sealed 6th October.

List of Patents

Granted for SCOTLAND, subsequent to September 22nd, 1843.

To John Mac Innes, of Liverpool, manufacturer, for improvements in funnels for conducting liquids into vessels.—Sealed 2nd October.

Goldsworthy Gurney, of Great George-street, London, for certain improvements in apparatus for producing, regulating, and dispersing light and heat.—Sealed 4th October.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, London, mechanical draftsman, for certain improvements in the manufacture of cyanogen and its compounds, particularly the prussiates of potash and soda.—Sealed 13th October.

James Combe, of Leeds, engineer, for improvements in heckling, cleaning, preparing, and carding flax, and other fibrous substances.—Sealed 16th October.

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New Patents
SEALED IN ENGLAND.
1843.

To Elisha Haydon Collier, of Goldsworthy Terrace, Rotherhithe, civil engineer, for certain improvements in the construction of furnaces and flues. Sealed 28th September—6 months for inrolment.

John Ainslie, of Redhaigh, North Britain, for a new or improved mode of drying tiles, bricks, retorts, and such like work, made from clay and other plastic substances. Sealed 30th September—6 months for inrolment.

John George Briggs, of Leicester, coach proprietor, for certain improvements in axles. Sealed 5th October—6 months for inrolment.

Edward Banton, of Walsall, Staffordshire, saddlers' ironmonger, for certain improvements in saddles and horse-harness. Sealed 5th October—6 months for inrolment.

Richard Boote, of Burslem, Staffordshire, earthenware manufacturer's clerk, for certain improvements in pottery and mosaic work. Sealed 5th October—6 months for inrolment.

Benedict Albano, of Piccadilly, civil engineer, for improvements in preparing materials, and applying them to the manufacture of ornamental mouldings and other useful purposes,—being a communication. Sealed 5th October—6 months for inrolment.

James Combe, of Leeds, engineer, for improvements in heckling, cleaning, preparing, and carding flax and other fibrous substances. Sealed 5th October—6 months for inrolment.

Ferdinand Charles Warlich, of Cecil-street, Gent., for improvements in the manufacture of fuel. Sealed 5th October—6 months for inrolment.

William North, of Stangate, slater, for improvements in covering roofs and flats of buildings with slate. Sealed 5th October—6 months for inrolment.

Jonathan Saunders, of Soho Hill, Birmingham, Gent., for improvements in the manufacture of tyres of railway and other wheels, and in the manufacture of railway and other axles. Sealed 5th October—6 months for inrolment.

James Griffin, of Withymoore Works, Dudley, manufacturer, for improvements in the manufacture of spades, shovels, and such like tools. Sealed 5th October—6 months for inrolment.

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John Baptist Soldi, of Windsor-place, Southwark, for improvements in apparatus for measuring of persons' heads, and for fitting and retaining hats, caps, and bonnets, according to such measure,—being a communication. Sealed 5th October —6 months for inrolment.

Charles Brown, of Woolwich, surgeon, for improvements in the manufacture of dip candles. Sealed 5th October—6 months for inrolment.

Laurence Hardman, of Liverpool, merchant, for certain improvements in machinery or apparatus to be employed in the manufacture of sugar. Sealed 5th October—6 months for inrolment.

John George Bodmer, of Manchester, engineer, for certain improvements in grates, furnaces, and boilers; and also in manufacturing or working iron or other metals, and in machinery connected therewith. Sealed 5th October—6 months for inrolment.

Margaret Henrietta Marshall, of Manchester, for a certain improved plastic composition, applicable to the fine arts, and to useful and ornamental purposes. Sealed 5th October—6 months for inrolment.

George Wall, Jun., of Manchester, Gent., for certain improvements in the methods or processes of manufacturing earthenware, china, and other similar substances; and also in the machinery or apparatus applicable to such manufactures. Sealed 5th October—6 months for inrolment.

Phillip Walther, of Angel-court, Throgmorton-street, merchant, for certain improvements in the construction of steam-engines, —being a communication. Sealed 12th October—6 months for inrolment.

John Cleaver, of Ripley, spelter-maker, for an improved furnace for subliming or reducing to a metallic state the ores of zinc. Sealed 12th October—2 months for inrolment.

Stephen Hutchison, of the London Gas Works, Vauxhall, engineer, for certain improvements in gas-meters. Sealed 12th October—6 months for inrolment.

Charles Brook, of Meltham Mills, Yorkshire, cotton-spinner, for certain improvements in machinery for spinning and twisting cotton and other fibrous substances. Sealed 12th October—6 months for inrolment.

Moses Poole, of Serle-street, Gent., for improvements in enve-

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loping medicine,—being a communication. Sealed 12th October—6 months for inrolment.

Stephen Geary, of Hamilton-place, King's Cross, civil engineer, for certain improvements in the construction of panelling and framing, applicable to all building purposes, cabinet-work, and other similar uses. Sealed 13th October—6 months for inrolment.

Richard Beard, of Egremont-place, New-road, Middlesex, Gent., for improvements in printing calicos and other fabrics,—being a communication. Sealed 13th October—6 months for inrolment.

Richard Tanion Nevill, of Llangennech, Carmarthenshire, Esq., for an improved mode of separating certain metals when in certain states of combination with each other. Sealed 18th October—6 months for inrolment.

William Watson, Jun., of Leeds, chemist, for certain improvements in ventilating houses and other buildings. Sealed 18th October—2 months for inrolment.

Julius Adolph Detmold, of London, merchant, for certain improvements in the construction and arrangement of furnaces or fire-places, applicable to various useful purposes. Sealed 18th October—6 months for inrolment.

James Graham, of Wapping, Middlesex, for improvements in the construction of pots or vessels, and furnaces used in the manufacture of zinc, and in other manufactures; and also improvements in the treatment of the ores of zinc in the process of manufacturing zinc. Sealed 18th October—6 months for inrolment.

Thomas Morton Jones, of Birmingham, merchant, for improvements in heating liquids and aeriform bodies. Sealed 18th October—6 months for inrolment.

James Gibbons, of New Radford, Nottinghamshire, machinist, and Thomas Roe, of the same place, machinist, for certain improvements in machinery used for what is called setting or reading patterns, and stamping or punching them in Jacquard cards. Sealed 21st October—6 months for inrolment.

George Edward Mylne, of Albion-terrace, Canonbury-square, Islington, watch-maker, for improvements in the construction of watches. Sealed 21st October—6 months for inrolment.

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CELESTIAL PHENOMENA FOR NOVEMBER, 1843.

D.	H.	M.	
1			Clock after the sun, 16m. 16s.
	—		☽ rises 2h. 11m. A.
	—		☽ passes mer. 7h. 56m. A.
	—		☽ sets 0h. 45m. M.
2			Occul *k*² Piscium, im. 4h. 42m. em. 5h. 53m.
3			Occul 45 Piscium, im. 14h. 50m. em. 15h. 48m.
3	2	55	♅ in conj. with the ☽ diff. of dec. 6. 21. S.
	11	35	☿ greatest Hel. Lat. N.
4	11	19	☿ in conj. with Ceres, diff. of dec. 5. 27. S.
5	7		☽ in Apogee
5			Clock after the sun, 16m. 16s.
	—		☽ rises 3h. 20m. A.
	—		☽ passes mer. 10h. 44m. A.
	—		☽ sets 5h. 14m. M.
6	5	27	♃'s third satt. will em.
6	19	16	♃'s first satt. will em.
7	5	22	Ecliptic oppo. or ○ full moon
	—		Occul 65 Arietis, im, 7h. 41m. em. 8h. 48m.
8			Occul *v*¹ Tauri, im. 13h. 46m. em. 15h. 7m.
9	3		Juno in conj. with ♃ diff. of dec. 2. 41. N.
	6	55	♃'s second satt. will em.
10			Occul Q^2 Tauri, im. 7h. 44m, em. 8h. 40m.
11	12	22	♃ in □ with the ⊙
	—		Occul ζ in Geminorum, im. 12h. 16m. em. 13h. 21m.
12			Occul 3 Cancri, im. 14h. 41m. em. 15h. 48m.
12	16	38	♀ in the descending node.
13	3	49	Juno in □ with the ⊙
	5	59	♃'s third satt. will em.
	9	29	♃'s third satt. will im.
15			Clock after the sun, 15m. 19s.
	—		☽ rises Morn.
	—		☽ passes mer. 6h. 5m. M.
	—		☽ sets 0h. 56m. A.
	2	33	☽ in □ or last quarter
	5	41	♃'s first satt. will em.
16			Occul *e* Leonis, im. 16h. 52m. em. 17h. 54m.
17			Mercury R. A. 14h. 44m. dec. 14. 42. S.
	—		Venus R. A. 16h. 16m. dec. 21. 31. S.
	—		Mars R.A.20h. 56m. dec. 19. 0. S.
	—		Vesta R. A. 15h. 0m. dec. 12. 35. S.
17			Juno R. A. 21h. 35m. dec. 13. 29. S.
	—		Pallas R. A. 13h. 44m. dec. 0. 15. S.
	—		Ceres R. A. 13h. 53m. dec. 3. 57. S.
	—		Jupiter R. A. 21h. 29m. dec. 15. 57. S.
	—		Saturn R. A. 19h. 33m. dec. 21. 53. S.
	—		Georg. R. A. 23h. 56m. dec. 1. 16. S.
	—		Mercury passes mer. 23h. 2m.
	—		Venus passes mer. 0h. 33m.
	—		Mars passes mer. 5h. 13m.
	—		Jupiter passes mer. 5h. 44m.
	—		Saturn passes mer. 3h. 49m.
	—		Georg. passes mer. 8h. 11m.
20			Clock after the sun, 14m. 18s.
	—		☽ rises 7h. 17m. M.
	—		☽ passes mer. 11h. 29mi. M.
	—		☽ sets 3h. 34m. A.
	8		☽ in Perigee
	10	2	♃'s third satt. will im.
	15	27	☿ in conj. with Vesta, diff. of dec. 3. 45. N.
	23	26	☿ in conj. with the ☽ diff. of dec. 3. 43. S.
21	5	34	Ecliptic conj. or ● new moon
22	3	52	♀ in conj. with the ☽ diff. of dec. 0. 34. N.
	7	36	♃'s first satt. will em.
24	23	5	♄ in conj. with the ☽ diff. of dec. 2. 49. S.
	—		Occul *o* Sagittarii, im. 6h. 38m. em. 7h. 20m.
25			Clock after the sun, 12m. 56s.
	—		☽ rises 11h. 7m. M.
	—		☽ passes mer. 3h. 31m. A.
	—		☽ sets 8h. 2m. A.
	7	52	♃'s fourth satt. will im.
26	23	33	☿ in the descending node
27			Occul c^1 Capricorni, im. 7h. 56m. em. 8h. 51m.
27	1	44	♂ in conj. with the ☽ diff. of dec. 6. 12. S.
	5	42	♃ in conj. with the ☽ diff. of dec. 5. 52. S.
28	7	6	Juno in the descending node
	8		☽ in □ or first quarter
30	8	38	☿ in conj. with the ☽ diff. of dec. 6. 31. S.
	11	26	♂ in conj. with ♃ diff. of dec. 0. 23. S.

J. LEWTHWAITE, Rotherhithe.

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THE

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No. CXLIV.

Recent Patents.

To Joseph Henry Tuck, *of Francis-place, New North Road, in the County of Middlesex, engineer, for certain improvements in machinery or apparatus for making or manufacturing candles.*—[Sealed 8th September, 1842.]

This invention of improvements in machinery for making or manufacturing candles, consists, Firstly, of a peculiar construction of apparatus, in which candles may by made on continuous wicks; and Secondly, of an apparatus, to be employed for finishing the butts, or bottoms and tips of such candles, as may require these operations.

In Plate XIII., fig. 1, represents a front elevation of the machine, all the several parts being in the positions they would occupy previously to filling the moulds; fig. 2, is an end view of the same; and fig. 3, a transverse section. The other figures represent different views of some of the working and internal parts of the machine, drawn to an enlarged scale.

a, a, a, represent the bobbins or spools, upon which the continuous wick of cotton or other suitable material is wound; or balls of cotton may be used, if preferred. These bobbins are mounted loosely upon axles, which hang in suitable bear-

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ings, attached to the frame-work. The continuous wicks, from the bobbins *a*, *a*, *a*, pass upwards over a breast-beam or board *b*, *b*, *b*, and through small holes *c*, *c*, *c*, made in the lower part of the stop-cocks *d*, *d*, *d*,—see the detached views of this part of the apparatus, figs. 4, and 5. The wicks then proceed upwards through the cocks *d*, *d*, *d*, and through the centre of the moulds *e*, *e*, *e*, to the tips of which the cocks *d*, *d*, *d*, are connected, as seen in the side view, fig. 4, and front view, fig. 5.

These stop-cocks may be constructed in any ordinary manner, but having a small hole through the plug, just large enough to allow the wick to pass easily into the cylindrical tube or mould. They are furnished with spring-levers *m*, *m*, *m*; one end of which is connected to the plug of the cock, and the other enters a hole or slot, made in a strip of thin iron, which is screwed or fixed on to the lower side of a horizontal sliding-rail *n*, *n*. The end of this horizontal sliding-rail *n*, *n*, is connected, by a joint, to the lower extremity of the hand-lever *o*, *o*, (see fig. 1); and when this lever *o*, is brought from the position, represented by dots in fig. 1, into that shewn by lines, the rail *n*, *n*, will be moved along, which movement will force the spring-levers *m*, into the diagonal position represented in figs. 1, and 5, and thereby close the several stop-cocks. It then becomes necessary to place the wicks above, in their proper position, in the centre of the cylindrical moulds, and hold them up in this position, which is done by tyeing a knot in each, and attaching it to a hook in the horizontal rail *q*. Then a sliding-rail *r*, is brought forward, covering about half of the apertures of the moulds, as shewn in fig. 6; and the rail *q*, at the same time receding, draws the wicks, in tension, into the vertical grooves in the plate, on the face of the rail *r*.

The melted material may now be poured into the trough, extending along the front of the machine, as shewn at *s*, *s*, *s*, when the candles will be formed by casting in the moulds. The material having been allowed to remain in the moulds or cylindrical tubes until cold, the surplus matter, occupying the trough above the tubes or moulds, must be removed by a knife or instrument, suitably constructed, previous to "drawing the candles."

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The first row of candles having become cold and hard, and the positions of the various parts of the machine reversed,—that is, the wicks unhooked, and the bar *r*, drawn back,—the candles, after being tapped or punched, in the usual manner, are to be severally drawn out of the moulds, by the hand of the workman, who takes hold of the knot, and lifting it perpendicularly, the candle slips readily out of its mould, drawing the length of cotton wick up through the mould, for the next row of candles. The knot of the wick, before mentioned, is then placed in a conical notch, cut in the rail above, at the bottom of the frame *g*, and, in that situation, the first row of candles hang, whilst a second row is cast in the moulds.

In order to carry on the manufacture of successive rows of candles in this apparatus, certain movements of the machine are required, which may be now explained, it being remembered that the stop-cocks have been opened by the movements of the machine, hereafter described, for the purpose of allowing a sufficient quantity of wick to be drawn up through the moulds, by drawing out the candles previously made, as described.

In order to open or loosen the stop-cocks, it is necessary to reverse the lever *o*, *o*, and bring it into the position shewn by dots in fig. 1; by this means the spring-levers *m*, *m*, will be drawn over into the opposite inclined position, and the wicks allowed to pass freely through the cocks.

The first row of candles, as at *f*, *f*, *f*, is suspended, in the manner above mentioned, by means of the knots from the lower side of the frame *g*, *g*, *g*; which frame is connected to endless chains *h*, *h*, (see figs. 1, 2, and 3). These chains pass over toothed pullies *i*, *i*, and a similar frame *g*, *g*, is connected to the endless chains *h*, *h*, one frame hanging in front of the machine, and the other a little distance behind, as seen in fig. 3. These frames are connected to the chains by swing pivots, so that when the front board is raised, the pivots pass over the pullies *i*, *i*, and go into the back position, at the same time bringing the hinder board forward. On the same axle as the pulley *i*, a small cog-wheel *j*, is mounted; this wheel gears into and is turned by a small pinion *k*, to the axle of which power is applied, by means of the winch *l*, figs.

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1, and 2. Now, as the winch *l*, is turned, it causes the wheels and pinions *i*, *j*, and *k*, to revolve, and, consequently, to raise, to the highest point, the front frame *g*, and at the same time to lower, into its place, the other frame which was behind. This frame, by exchanging positions with the former, and being, as seen, advanced, causes all the conical notches to take hold of the taper ends of the candles of the upper row, and a straight board *g**, is then placed against the front of the row of candles, which holds them securely. These frames are furnished with a top and bottom row of notches, as seen in fig. 1, formed so as to prevent the candles from falling sideways, or dropping down.

The knots, by which this first row of candles were suspended from the conical notches of the upper frame *g*, are then cut off, by passing a sharp knife, or other instrument, under the lower edge of the top frame *g*, which is then passed into the back position. This operation having been performed, a fresh supply of wick will be found in the moulds *e*, *e*, *e*; and it now becomes necessary to tighten or close all the cocks *d*, *d*, *d*, which is effected as before mentioned, by reversing the position of the lever *o*, and bringing it into the position shewn in fig. 1.

The next thing to be done is to place the wicks in the centre of the moulds; and to effect this readily, they are taken hold of and held by the hooks *p*, *p*, *p*, on the horizontal bar or rail *q*. In order to take hold of the wicks, these hooks have to perform a forward, lateral, and a retrograde motion, at the same time the metal slide *r*, *r*, *r*, which is furnished with vertical grooves, (see fig. 9,) is moved outwards; and when the hook-bar *q*, *q*, retrogrades, it brings the wicks into the grooves of the metal slide *r*, *r*, *r*, and securely holds them there, the metal slide having, as before mentioned, been moved outwards, until it covers about one-half of the aperture of the moulds, as seen in fig. 6. These movements are effected in the following manner:—

To the back part of the hook-bar *q*, a flat metal plate *t*, is screwed in a horizontal position, (see fig. 6); which plate is represented detached at fig. 7. In this plate there is cut a peculiarly shaped slot *u*. The plate extends backwards

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through a groove or space cut in the sliding-bar *v*, *v*; this bar supports an upright axle, which carries two horizontal brass pullies *w*, *w*,, that work in the slots cut in the plate *t*, and also in the one below it, hereafter to be described.

A peculiarly shaped cam *x*, is mounted on a fixed centre, in the back framing of the machine; and the axle of the brass pulley *w*, works in a long slot, made in the cam *x*, as seen in fig. 7.

The metal plate *t*, is also furnished with pins or stops *y*, *y*, which, by abutting against the cams, as aforesaid, prevent the plate from having a lateral motion, until the stop *y*, escapes from the ear of the cam. The sliding-bar *v*, has a lateral motion, communicated to it by means of the hand-lever *z*. This lateral motion causes the brass pullies *w*, to advance along the slot *u*; and as the plate *t*, and hook-bar *q*, to which it is attached, are prevented, by the pin-stops or studs *y*, from moving laterally, the said plate and hook-bar *q*, are forced outwards, until one of the studs *y*, escapes from the ear of the cam *x*, which it will do the moment the brass pulley has arrived at the apex of the angle of the slot *u*; then, as there is nothing to prevent it, the plate *t*, and hook-bar *q*, move or slide laterally, with the assistance of the other stud *y*, until the end of the hook-bar abuts against the end framing of the machine, when the continued forward motion of the rod *v*, and pulley *w*, pressing against the opposite inclined side of the slot *u*, causes the hook-bar to retrograde; this motion of the pulley *w*, causes the hooks to traverse three sides of a square, viz., outwards, lateral, and retrograde, and thereby to take hold of the wicks; which movement is completed by the advance of the metal slide *r*, *r*, simultaneously with the movement of the hook-bar. The metal slide *r*, *r*, is affixed to a wooden bar, to which is also affixed a horizontal metal plate 1, 1, similar in size and shape to the plate *t*, immediately beneath which it is situated, as seen in fig. 6. This plate 1, 1, seen detached at fig. 8, has also a slot of peculiar form, one-half being inclined and the other half straight. The under brass pulley *w*, works in this slot, in a similar way to the other pulley *w*, in the plate *t*. The

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ends of the metal slide *r*, *r*, fit accurately to the end framing, and thereby form a trough for receiving the melted material; and therefore, when, by moving the sliding-rod *v*, laterally, the brass pulley *w*, advances along the inclined slot, the plate 1, 1, and the metal slide *r*, *r*, to which it is connected, are obliged to move outwards, until the pulley *w*, arrives at the end of the inclined slot, when it will advance along the straight part of the slide, without acting upon the plate. The parts of the machine being thus situate, it only remains to make every thing tight previous to pouring in the melted material; this is effected by shogging the lever *z*, *z*, to the position shewn by dots in figs. 3, and 6, when it will enter a notch cut in the back part of the slide 2, 2; on the front part of which several inclined planes 3, 3, are placed, immediately beneath a corresponding number of rollers 4, 4, mounted in suitable bearings, as seen in fig. 9. Having shogged the lever *z*, it is now to be raised at one end, by which it will move the slide 2, 2, laterally, thereby forcing the inclined planes under the rollers 4, 4; the bearings of which, being fixed, cause the metal slide *r*, *r*, to press tightly against the bed, and prevent any of the melted material from getting under it.

The apparatus is now quite ready for a fresh supply of the melted material, which is, as before mentioned, poured into the trough *s*, *s*; and when cold and ready to draw, the cocks *d*, *d*, are loosened, by means of the lever *o*, *o*, and the wicks are disengaged from the hooks, at the same time that the metal slide *r*, *r*, and the inclined planes 3, 3, are drawn back. After the candles have been tapped or punched, as before mentioned, the winch-handle *l*, is turned, and the empty frame *g*, above, is brought down to receive the second row of candles, and the full frame is at the same time raised to the highest point, thereby drawing the new candles out of the moulds. A front board or guard *g**, is now put on the hooks, in the frame *g*, as before, to prevent the candles from falling out. The top row is then disengaged from the wick, by simply passing a sharp knife, or other instrument, below the frame *g*, which will thereby leave the candles a sufficient

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length of wick for lighting. The full frame may then be passed over to the back part of the machine, and the candles removed therefrom at leasure.

In cases where a considerable heat is not required to melt the tallow, or other material, intended to form the candles, the patentee substitutes a peculiarly-formed tip to the moulds, in place of the stop-cocks, as above described. This construction is shewn at fig. 10, of the accompanying drawings, in which *c*, *c*, represent a portion of a candle-mould, in vertical section. The tip constituting the improved form, consists of a narrow tube and flange *d*, soldered or otherwise attached to the bottom of the mould. At the reverse end of this tube *d*, is formed a block *f*, through which the aperture of the tube is continued for the passage of the wick *g*, (as above described with reference to the stop-cocks,) the aperture being of such a diameter as to compress the wick rather tightly as it passes through it. By this arrangement the melted tallow, or other material, will be prevented from passing beyond the tube *d*; for, on its arrival at the bottom thereof, the enlarged portion *f*, will abstract the heat therefrom, and, consequently, reduce it to a solid state. The improved tip may be made of any suitable material, and the enlarged portion thereof of any required shape or size, provided the bulk is sufficient to solidify the fluid material as it descends.

The apparatus employed for trimming or finishing the butts or bottoms, and also for forming tops to such candles as may require it, is shewn at figs. 11, and 12;—fig. 11, represents a front elevation of the machine, some of the parts being shewn in section, in order that they may be more clearly seen; and fig. 12, a plan view of the same. The apparatus resembles, in most parts, a common lathe, moved by a treadle *a*, *a*, in the ordinary manner.

Rotary motion is communicated from the large pulley to the small pulley *b*, above, by means of a band. A knife or cutting instrument *c*, of a peculiar construction, hereafter described, is screwed or otherwise fastened on to the axle of the small pulley *b*. The candles to be operated upon are placed in a series upon an inclined board *d*, *d*, attached

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to the side of the machine, and they are severally brought from thence on to a block *e*, having a curved groove at top, to receive a candle. The candle is firmly held in this groove, and its end pressed against the edge of the knife or cutting instrument *c*, by the hand of the attendant, or in any other convenient manner; and rotary motion being at the same time given to the knife, by means of the treadle, the butt or bottom is thereby made perfectly smooth. The cuttings or shavings from the candle are confined by the cover *f, f*, and made to fall into a box or receiver *g*, below. The peculiarly-shaped knife or cutting instrument *c*, employed for cutting the butts or bottoms of the candles, is shewn in plan at fig. 13. The knife, for forming the tips, is shewn detached from the holder at fig. 14. Figs. 15, and 16, are two views of a knife, of somewhat different shape to the former, which may also be employed for the same purpose as fig. 14.

The patentee claims all the parts above described, however differently they may be arranged, save and except the spools or bobbins for carrying the cotton; also the application of the tip to candle-moulds, as described with reference to fig. 10; such tip consisting of a narrow tube, attached to the bottom of the mould, and having, at its lower end, an enlarged portion of any suitable shape or dimensions; and lastly, the application of rotatory motion, obtained by machinery, for cutting the butts and tips of candles, in whatever way that motion may be effected.—[*Inrolled in the Petty Bag Office, March*, 1843.]

Specification drawn by Messrs. Newton and Son.

To ANDREW BARCLAY, *of Kilmarnock, Scotland, engineer and brass-founder, for certain improvements in lustres, chandeliers, pendants, and apparatus connected therewith, to be used with gas, oil, and other substances, which invention is also applicable to other purposes.*—[Sealed 24th March, 1843.]

THIS invention consists in an improved method of suspend-

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ing lustres and pendants of every description, whereby the ordinary weights, hitherto in use, for raising and lowering gas lamps, lustres, pendants, and chandeliers, are dispensed with, and, in place thereof, one, two, or more fusees, with coiled springs, contained therein, are employed.

In fig. 1, Plate XIV., *a*, *a*, are the fusees containing the springs; *b*, the pendant, which is connected by a cord, gut, chain, or other flexible substance, to a tube *c*, which tube is affixed in the ordinary way to the ceiling of the apartment, or place of suspension; the drawing represents the lustre or pendant at its highest position, or when the springs are at their minimum of extension; the connecting cord, or other flexible substance, is then wound on the fusee.

The effect of these improvements is, that lustres, chandeliers, or pendants, may be raised or lowered with uniform counteraction; the action of a fusee and spring being, that an equal motive power is exerted throughout, by reason of the greater leverage of the cord on the increasing diameter of the fusee, a principle well known and familiar to mechanics. Therefore, when the lustre or pendant is at its lowest position, the fusee will be discharged of the cord or gut, and the spring will be at its greatest tension, and *vice versa*, when returned to its elevated position.

Fig. 2, shews one of the fusees in section, and the spring contained therein, with the tube for affixing it on the cross-bar. Fig. 3, is an end view of the same, to exhibit more clearly its construction. By using one, two, or more springs, and varying their breadths, according to the weight to be suspended, the invention may be applied to any lustre or pendant.

The patentee states, that although he has shewn in the drawing, the position of the springs and fusees, which he most approves of,—yet he does not restrict himself to this or any other form, but to whatever position the fusees may be applied to the raising and lowering of lustres, pendants, and other suspended lamps. He claims the exclusive right and privilege to the application of fusees and coiled springs, for raising and lowering lustres, pendants, and chandeliers.—[*Inrolled in the Rolls Chapel Office, August*, 1843.]

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To WILLIAM HENRY SMITH, *of Fitzroy-square, civil engineer, for certain improvements in the construction and manufacture of gloves, mitts, and cuffs, and in fastenings for the same, which may be applied to articles of dress generally.* —[Sealed 19th April, 1843.]

THIS invention consists, Firstly,—in the application of a pocket or purse to any convenient part of a glove, mitt, or cuff, to receive any small article (such as coins or notes) requiring to be safely deposited, and easy of access. Secondly,—in uniting the portions of leather necessary to form a glove or mitt, by means of glue or cement, instead of the ordinary sewing. Thirdly,—in a new mode of cutting out the parts to form a glove or mitt, so as to give additional beauty when on the hand, and also in uniting them, so as to afford strength in certain parts likely to tear; and Fourthly,—in applying to gloves, mitts, or cuffs, peculiar kinds of fastenings, of the forms and description hereinafter shewn and explained.

In Plate XIV., fig. 1, represents the outside of a glove, with the pocket or purse applied, as at *a*, which may be done in the following manner:—A circular or other suitably-formed piece of the material, is punched out and attached (by cementing or sewing, or both combined,) in any convenient part of the palm of the glove or mitt. The form of this piece, and its situation in a glove or mitt, is shewn by dots in fig. 1. A slit, of the length desired, is cut in the front of the palm, to form the mouth of the pocket or purse. The aperture or mouth of the pocket or purse is then bound with narrow India-rubber web, crossed in the middle, as shewn at *b*, the ends of the web being sewn together at *c*, which is designed to keep secure the smallest article deposited therein. The opening being elastic, will admit of articles, as large as the mouth of the pocket, being deposited, while it is calculated, at the same time, to keep smaller ones in safety. It will be evident, that a pocket or purse may be formed or applied in various ways; but the mode just described will be found to answer the purpose.

In order to save the expense of sewing the parts together,

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to form a glove or mitt, the patentee takes the pieces of material, when cut out, and unites them, by overlapping and placing any known insoluble glue or cement between the two substances, near the edge. The cement he prefers using, is that commonly called or known as Jeffery's glue, which may be also applied as a means of securing the ends of the threads, in the ordinary process of sewing, (by fixing down therewith in the seam about one-fourth of an inch of the thread,) to prevent their drawing, and thus allowing the seams of the glove or mitt to open, as is frequently the case, for want of such like securing.

At figs. 2, and 3, are represented a plan and edge view of an improved form of the ordinary sewing machine, (viz.) with curved ends, as shewn; the object being to effect a neater seam at the thumb and fingers, by working round suitable curves, instead of a long or straight line, as heretofore. The sewing machines are intended to be made of glass instead of metal, in order to prevent the soiling of the gloves, mitts, or cuffs, during the operation of sewing.

Figs. 4, and 5, represent the trank and palm, necessary to form a glove, under the improved mode of cutting out; fig. 4, shewing the trank, to form the back and thumb in one piece, and fig. 5, the palm or inside of the glove. The object of this part of the improvements is to avoid the disfigurement caused by joining two different qualities of leather, (the thumb being usually cut from the shanks of the skin,) as well as the kind of patched appearance which, by the ordinary mode of cutting out, would be presented at the socket of the thumbs and other parts, by having seams so different from the natural curvature and lines of the hand. An additional disfigurement, arising from the cutting out of small thumb-holes in the trank, with the view of saving material, is likewise obviated.

A further object to be attained, by this part of the improvements, is the giving strength in certain places, such as at *d*, and *e*, figs. 1, and 5, where the junction is formed between the thumb-piece *f*, and the inside or palm *g*. This is effected by causing ends of the inside or palm *g*, to overlap in a somewhat triangular form, as shewn by the dotted lines

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in fig. 1. The liability to tear at the back, will also be obviated, by the ordinary thumb-seam not being required.

Figs. 6, and 7, shew the form of fastenings to be applied to gloves, mitts, and cuffs, and which may be applied to articles of dress generally. Fig. 6, is a simple oval eyelet, punched on the leather, or in any other convenient way fitted to the material; and fig. 7, is an eye or catch, both of which are intended to enclose a stud or button. It will be perceived, that the eyelet or catch will have to be brought to an angle with the stud or button, before the connection can be broken; the diameter of the latter being large enough to cause it to overlap or rest upon the sides of the former. Thus the connection will be secure from the ordinary liabilities of the parts of any articles of dress to become unfastened.

The patentee does not confine himself to the precise forms and arrangements shewn and described, but he claims, Firstly, —the application of a pocket or purse to any convenient part of a glove, mitt, or cuff, with the object hereinbefore mentioned. Secondly,—the employment of glue or cement, as a mode of uniting the leather required to constitute a glove or mitt; and also an application of the same material, in the way described, for the purpose of securing the ends of the threads from drawing, when the parts are united by sewing; and also the improvements in the ordinary sewing machines, shewn at figs. 2, and 3, and described. Thirdly,—a mode of cutting out the parts, to form a glove or mitt, by which the union of the thumb, as a separate piece, is avoided; and Fourthly,—a mode of fastening, either applied to gloves, mitts, or cuffs, or to articles of dress generally, (of which two forms are shewn at figs. 6, and 7,) in which the two members of the fastening will not become disconnected, until they are brought to form an angle one with the other.—[*Inrolled in the Rolls Chapel Office, October*, 1843.]

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To JOHN MAC INNES, *of Liverpool, in the county of Lancaster, manufacturing chemist, for his invention of certain improvements in funnels for conducting liquids into vessels.* [Sealed 20th April, 1843.]

THESE improvements consist, Firstly, in applying to funnels an air or vent tube, by means of which, the air, displaced in the process of filling a vessel, is prevented from obstructing the free admission of the liquid; Secondly, in the application of a valve as well as the air tube, in order to stop or retain any portion of the liquid in the funnel whilst removing it from the filled vessel; and Thirdly, in applying to funnels an air tube, in conjunction with another tube, having a whistle attached, by which means, warning is given to the operator when the vessel is full or nearly so, and thus, the loss arising from overflow is prevented.

In Plate XV., *a*, *a*, *a*, fig. 1, is the air tube, bent so as to suit the form of the funnel, one end being attached to an orifice *b*, in the spout *c*, of the funnel; *d*, *d*, is a lapping of soft string, or other substance, to cause the spout of the funnel to fit closely in the mouth of the vessel. The small orifice *b*, for the escape of the air, is placed a short distance from the end of the spout, to prevent the descending liquid from obstructing it. It will be seen by this arrangement, that as the liquid is poured into the vessel, the displaced air will escape by the orifice *b*, free and unobstructed by the liquid, until such time as the liquid, in rising, covers the orifice; when this occurs, no more air can escape; consequently, no further admission of liquid can take place, and any additional quantity poured into the funnel will remain therein. This superabundant quantity of liquid would have to be returned, by lifting and inclining the vessel, before removing the funnel; but at fig. 2, is shewn the application of a valve, by which the liquid will be retained in the funnel upon its removal from the vessel. *e*, is a conical valve, fixed to the spout of the funnel, to which is attached a spindle *f*, *f*, passing up through the guides *h*, *h*; at *i*, there is a screw cut in the spindle *f*, *f*, which, working in the nut *g*, allows the valve

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to be raised or depressed at pleasure. At fig. 3, *a*, *a*, is the air tube; *k*, *k*, the whistle tube; *b*, the external opening to the air tube; *l*, the opening to the whistle tube; *m*, the whistle; *p*, an orifice in the air tube, to allow the air to escape freely; *n*, an opening or communication between the whistle and air tube, seen more clearly in the enlarged section, fig. 4. The object of this communication is to allow a portion of the air, passing through the tube *a*, *a*, to escape by the fissure in the whistle, in an opposite direction to that which is passing through the whistle tube, thereby preventing the whistle from sounding until such time as the counteracting current is stopped by the liquid rising and covering the orifice *b*. By this arrangement it will at once be seen that the air, while the vessel is filling, has a free and unobstructed escape by the two tubes *a*, and *k*, but as soon as the liquid reaches the orifice *b*, warning is given by the whistle, which will continue to sound until the orifice *l*, is covered by the liquid: the time, during which warning is given by the whistle, will depend upon the distance between the two orifices *b*, and *l*.

The patentee remarks, in conclusion, that although these improvements may be applied with advantage, either separately or united, to all sizes of funnels, he generally applies the first and second improvements to the smaller description of funnels, or such as are generally used for filling glass and stone bottles; and the third improvement to the larger sizes, or such as are used for filling casks.—[*Inrolled in the Petty Bag Office, October*, 1843.]

Specification drawn by Messrs. Newton and Son.

To Joseph Kirby, *of Banbury, in the county of Oxford, Gent., for an improved apparatus for making bricks, tiles, and other articles, from clay or earthy materials.*—[Sealed 26th January, 1843.]

This improved apparatus for manufacturing bricks, tiles, and other articles, consists in a novel construction and arrangement of machinery, by means of which, clay, or earthy ma-

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terials, in an unprepared or natural state, being deposited in a hopper, are conducted, by means of rollers, down into a moveable mould; which mould, being then slidden under a press, the loose clay or earth, contained therein, is firmly compressed into the mould, and formed into the desired bricks or other articles. The further progress of the mould, under an inclined plane, then causes the mould to be lowered, and the bricks, or other articles, to be left standing up free upon pistons, from whence they are slidden on to a plate, ready to be removed by hand, whilst the mould passes back again under the hopper to receive a fresh supply of clay or earthy material.

In Plate XIV., fig. 1, is a side elevation of the machine; fig. 2, a longitudinal section; and fig. 3, a horizontal view. A, A, A, represents the framework of the machine, in which a horizontal shaft B, is mounted, from whence the moving parts of the machinery derive their actuating power; C, is a hopper, fixed to the framework, for receiving and delivering the clay or earthy materials; and D, is the mould, which is shewn detached in different views, at figs. 4, 5, and 6. Fig. 4, represents the horizontal or top view of the mould; fig. 5, a side elevation of the same; and fig. 6, a sectional elevation; the last two figures shewing the parts by which the mould is carried along the machine. Rotary motion being given to the shaft B, by any convenient means, a large toothed wheel E, fixed thereon, taking into pinions F, and G, communicates rotary motion to the working parts of the machinery. The pinion F, is fixed upon the axle of one of the pair of cylindrical rollers H, H, within the hopper, which rollers are coupled together by a pair of pinions I, I, at the further ends of their axles. The clay or earthy materials being put into the upper part of the hopper, the rotation of the cylindrical rollers will conduct the earth down to the lower part of the hopper. The mould D, must be placed immediately under the hopper, as shewn by dots in the section; the sliding plate *a*, which closes the bottom of the hopper, having been pushed back by the top edge of the mould as it comes into that position; and when the mould, after being filled with earth, slides away again, a weighted chain *b*, *b*, replaces the sliding

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plate and closes the bottom of the hopper, until the mould returns to be re-charged. The mould D, slides up and down upon a frame of blocks K, which are made fast upon a table L; and to the under part of this table L, a horizontal rack-bar M, is affixed. A pinion *c*, upon a small shaft *d*, that passes transversely through the machine, takes into the rack M, and as the pinion revolves with a reciprocating action, it drives the rack-bar M, and with it the table L, the blocks K, and mould D, to and fro, from one end of the machine to the other. This pinion *c*, is driven from the pinion G, through a train of bevel gear *e*, *f*, and *g*, the last of which, fixed at the lower end of an inclined shaft *h*, takes into one of the mitre wheels *i*, or *k*, as the occasion may be. These mitre wheels *i*, and *k*, are attached to a hollow axle *l*, sliding laterally upon the end of the shaft *d*, and the hollow axle is confined by a key, and shifted in its position upon the shaft *d*, by means of a lever *j*, and grooved cam N, on the outer end of the main shaft B. The groove of the cam N, is so formed and arranged, that when the mould, placed under the hopper, has been filled with clay or earth, the pinion *g*, is thrown into gear with the bevil wheel *i*, and when that is the case, the rotation of the great wheel E, will, through the pinion G, and the gear connected thereto, cause the rack-bar M, with the table L, and blocks K, K, to slide away from the hopper upon the edges of the horizontal part of the framework A. The mould D, as before said, slides up and down upon the blocks K, but is kept up by two rollers *m*, *m*, attached to its ends running upon side rails *n*, *n*. It will be perceived, by reference to figs. 1, and 3, that these side rails lie horizontally in that part of the machine which is under the hopper, but a little further on they incline downwards. There are, however, two lever bars *p*, *p*, one on each side of the machine, which hang upon pivots, and continue the horizontal railway for the rollers *m*, of the mould D, to run upon, until it has arrived in the middle of the machine under the press. At the period when the mould has reached this situation, the groove of the cam N, has slidden the pinions *k*, and *i*, into the middle position, so that the pinion *g*, will then be out of gear with either of them,—the table, with the mould, then necessarily stands still. When

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the mould is thus placed, the platten P, of the press, is brought down upon its top by the rotation of the excentrics Q, Q, upon the shaft B. By these means, the mould is depressed, and the clay, which is supported beneath by the blocks K, becomes compressed closely in the mould, and thereby formed into bricks.

The mould D, it will be perceived, is at this time supported by its rollers *m*, bearing upon the lever-bars *p*; the table L, with the blocks K, resting firmly upon the sides of the horizontal parts of the framing A, A. The descent of the platten P, therefore, causes the mould D, to slide down over the blocks, (the lever-bars tilting up at that time,) and thereby leave only as much room in the upper part of the mould as shall be sufficient to form the compressed clay into the required size of the bricks, or other articles moulded therein. When this pressure upon the clay has been thus effected, the platten P, rises again, and the further rotation of the cam N, causes the rack-bar M, with the table, blocks, and mould, to move on in the same direction as before; in doing which, the rollers *m*, at the sides of the mould, pass under two inclined rails *q*, which further depress the mould D, and cause the bricks to stand up free from the mould upon the blocks K, K, as shewn by dots in fig. 2. As the blocks thus move along, a stationary plate of iron *r*, fixed at the end of the machine, cuts the lower edges of the bricks off the tops of the blocks, and receives them ready to be removed by hand. The further rotation of the cam N, now causes the bevil-wheel *k*, to be slidden into gear with the pinion *g*, when a retrograde movement of the rack-bar M, takes place, which conducts the table, blocks, and empty mould, back again. The rollers *m*, on the sides of the moulds, as it thus returns, pass along the upper surfaces of the inclined parts of the railways *n*, *n*, and under the uplifted ends of the lever-bars *p*, *p*, which, consequently, causes the mould to be raised to its former position; and as the mould passes under the hopper, it pushes away the plate *a*, as before described, and rests in the position shewn by dots, at the right-hand end of fig. 2, under the hopper, whilst it is again filled with clay, or earthy materials, to be

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made into bricks, or other articles, by the means above explained.

The patentee claims, Firstly,—the general arrangement of machinery or apparatus for making bricks, tiles, and other articles, from clay or earthy materials, as above described, and shewn in the drawings; subject, however, to such modifications, in its parts, as may be necessary to suit different forms and dimensions of bricks, tiles, and other articles, as well as in the numbers of such articles to be made at one operation; which modifications will not require any material change in the forms or arrangements of the parts of the machinery; and Secondly,—the particular construction and mode of supporting and working the blocks, with the mould sliding thereon, for the purpose of confining the clay, or other earthy materials, whilst receiving pressure, and afterwards discharging the bricks, or other articles so formed, in order that they may be readily taken from the machine.—[*Inrolled in the Petty Bag Office, July*, 1843.]

Specification drawn by Messrs. Newton and Son.

To William Barnard Boddy, *of St. Mary, Newington, surgeon, for improvements in apparatus and means for opening, shutting, and fastening every description of sliding and lifting window-sashes, windows, and window-shutters.* —[Sealed 31st January, 1843.]

This invention consists in the application of various modifications of a rack and catch, (with or without a bolt,) to the sides of what are generally denominated lifting and sliding window-sashes or windows, and window-shutters, for the purpose of their being opened, shut, or fastened, without the use of pullies, lines, weights, and the usual sash furniture, as at present constructed.

The racks are let into and fixed in the edges of the sashes, or in the parting-bead or pulley-style of the window-frames; and opposed to them, in any of these positions, there is a little metal box, similar to a small lock, furnished with a catch, to

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strike into the before-mentioned rack. If the catch is fixed in the sash, it is drawn out of action by a knob or handle, in front of the sash; but if the catch is fixed in the pulley-style, it may be detached by means of a key, of any suitable construction, permanently fixed, or capable of being withdrawn, and secured by a small chain, or taken away altogether, similar to an ordinary key. The key is introduced to the apparatus through a hole, made partly in the pulley-style, and inside lining. When the windows are large and heavy, the above apparatus should be attached to each of their sides, for the purpose of keeping the edge of the sash close up, and the meeting-rails even and flush; in this case, the upper sash is opened, or the lower one shut, by detaching the catch on one side first, and keeping it back by a small hook or pin; then release the other, and the sash will be free to move. This method is only necessary when the windows are very large and heavy, as in almost every case the apparatus affixed on one side only will be found sufficient.

In addition to the catch supporting the sashes at any point, it becomes a self-acting fastener for the lower window-sash, by the following means:—At the bottom of the rack (the sharp edge of which is reversed) there is a square-shouldered recess, cut into the wood, for receiving a greater projection of the catch; and when the catch has entered the recess, it effectually prevents the sash from being opened on the outside, in consequence of a slight indentation in the upper part of the catch coming in contact with the sharp reverse edge of the rack.

Another part of the invention consists in introducing the means of securing the lower sash at any required height, which is accomplished as follows:—In the upper part of the apparatus, containing the catch, there is a small bolt, which is thrown by a key (similar to a common lock) into a rack of square-shouldered indents; so that when the catch rests at any point of opening upon the bottom part of one of the square indents, the bolt, being thrown, enters the square indent, making it impossible, without violence, to move the sash, until the bolt is withdrawn;—the same key should be used for the upper and lower sashes. To prevent the too

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sudden detachment of the catch, and consequently the falling of the sash, in opening or shutting the window, the patentee sometimes makes the catch with a small projecting tooth or hook, which hangs over the tooth of the rack, making it thereby quite impossible to remove the catch from its situation within the rack, without the sash being first lifted a little by the other hand. In order that the window-sashes may move with greater facility, small anti-friction rollers are introduced in the sides of the sashes, to run against the frame, and to correct any irregularity in the pulley-style, or the sashes of old windows or frames. These rollers are fixed in spring-plates, which yield to inequalities of the frames. The rollers may be either of wood or metal, with a metal plane for them to work upon, if necessary. For the convenience of lifting the sashes, in some cases, it may be desirable to fix handles, either in the styles, or rails of the sashes; these handles may be of the fixed kind, or flush with the wood, similar to a flush desk-handle; but, in either case, they should be fixed in such a situation, that whilst the hand is used for lifting the sash, the thumb may be occupied in disengaging the catch. In order that the catch may quickly enter the indents of the rack, a spring is applied to the back of the catch, to force it forward the instant it has passed the point of the rack; but the same effect may be accomplished by making the catch with a projecting back, so that it may fall in, by reason of the weight of such projection, on the same principle of operation as the common drop-sash fastener. To afford facility for taking the sashes out of the frames to be cleaned, painted, or repaired, the parting and inner bead, on one side of the window, should be made easy of removal, so that, by holding back the catch, the sashes may be taken out with ease.

In Plate XV., fig. 1, is a section of part of a window-frame, containing the catch-box and spring-catch; *a*, being the catch; *b*, the catch-box; *c*, the spring; *d*, the centre on which the catch turns; and *e*, the thumb-pin or trigger, which, on being pushed inwards, releases the catch from the rack *f*, which is here shewn attached to the sash-frame. Fig. 2, represents the meeting-bars of the window, with the racks

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f, f, and friction rollers *g, g,* attached. Fig. 3, shews the catch in action, supporting the upper sash; and fig. 4, the catch to keep down the lower sash: both these catches are drawn back out of action by the key *g,* (shewn separately at fig. 5,) and are therefore represented without the thumb-pin. Fig. 6, represents the sort of rack used when the locking-bolt *h,* is added to the catch; fig. 7, is a representation of a self-acting catch; and fig. 8, is a separate view of the spring friction roller.

The patentee claims, as his invention, the use of the rack, catches, and lock-bolt, with key, acting in the said rack, as such supporters and fasteners, and as means for opening, shutting, and fastening windows, window-sashes, and shutters, of the kind hereinbefore described, combined in any of the various ways above mentioned.—[*Inrolled in the Rolls Chapel Office, July,* 1843.]

To Edwin Edward Cassell, *of Mill Wall, Poplar, in the county of Middlesex, for improvements in lamps.*—[Sealed 17th December, 1838.]

This invention consists, Firstly,—in improved forms of burners, (which are used without wicks,) for burning essential oils, spirits, mineral tar, wood tar, resin, naphtha, or other inflammable liquids, or the products or mixtures thereof. Secondly,—in a method or methods of directing the flow of such fixed or essential oils or spirits, or other liquids or mixtures, for the said purpose. Thirdly,—in causing the atmospheric air, or other supporter of combustion, to blow over the flame, in the manner hereafter described; whether such flame be obtained by the combustion of any bituminous, resinous, oily, or fatty matter, or of any gaseous body; and Fourthly,—in a mode of supplying air to lanterns.

In Plate XV., fig. 1, is a side view, and fig. 2, a transverse section of a flat burner, for obtaining light by the combustion of the essential oil of coal tar, or spirits of turpentine, or a mixture of either of these with spirits of wood or alcohol; it may also be

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used with any other liquids or mixed fluids that will burn at a low temperature. *a*, is a narrow vessel, into which the liquid to be consumed is forced, through the pipe *c*, and ascending through perforations or slits in the gutter or trough at the upper part of the vessel, is ignited; any of the liquid that may flow over, is received by the vessel *b*, and conducted by the pipe *d*, to the waste reservoir. Air is admitted to the burner through the cap *e*.

Fig. 3, represents a cylindrical burner, in section. *a*, is a vessel for containing the liquid, and *b*, a vessel for receiving the overflow; the inner edge of the upper part of the vessel *a*, being rather higher than the outer edge, to prevent the liquid from running down the air passage *f*. The supply of air to the interior of the flame, through the passage *f*, is regulated by means of the plate *g*, screwed on the upper end of the rod or stem *h*; this rod is supported by a bridge *i*, and is turned by a button at its lower end, if the regulating plate *g*, is required to be raised or lowered. When the regulating plate is lowered, the air is caused to pass in centrifugal and deflected lines over the top of the burner, with considerable force; and when the plate is raised, a higher flame is produced, but accompanied with smoke. The regulating plate may be made of any suitable form; and, if preferred, the stem *h*, and cap *e*, may be made hollow, and filled with water, for the purpose of keeping the burner cool.

Fig. 4, is a transverse section of another cylindrical burner, in which the vessel *a*, is enclosed in an annular vessel *b*, so that the overflowing liquid may run down on both sides of the vessel *a*, and escape to the waste reservoir; the vessel *a*, has a gutter at the upper part, the same as the burner shewn at fig. 1. When this kind of burner is constructed in a manner suitable for producing two or more concentric rings of flame, the shape of the regulating plate is varied.

The improved mode of supplying air to lanterns, consists in admitting it through openings in the upper part of the same, and conducting it through descending pipes, (which form part of the framing,) to the burner.

The patentee claims, Firstly,—the groove or gutter, above

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described; whether such groove or gutter be filled or partially filled with combustible liquid, supplied through holes, or through one or more cuts or slits in it. Secondly,—the use of the regulating plate, above described; whether the said plate be round, curved, square, or polygonal, and plane or cupped; and whether it be supported and acted upon from below or above the light, or on one side of the burner or lamp; provided, always, that such regulator be used as a means of regulating and directing the atmospheric air, or other supporter of combustion, from within the circle, or other hollow figure of the flame. Thirdly,—the use of the hollow stem, or enlarged spindle, for containing cooling fluid, and of the hollow cap for the same purpose. Fourthly,—the method of supplying atmospheric air, or other supporter of combustion, to a lantern, by means of pipes or tubes, brought down at the corners of such lantern.—[*Inrolled in the Inrolment Office, June*, 1839.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, patent agent, for an invention of certain improvements in the manufacture of artificial fuel,—being a communication.*—[Sealed 13th October, 1842.]

This invention relates to the machinery employed in the manufacture of fuel; and the improvements consist, Firstly,—in certain novel or improved apparatus for mixing and heating the ingredients of which the fuel is composed; and Secondly,—in an improved stamping or compressing apparatus, in which the fuel is submitted to pressure, and formed into bricks, of the required shape and size. In reference to the first head of the invention, two constructions of apparatus are shewn for mixing the ingredients together.

In Plate XIV., fig. 1, represents a longitudinal section, and fig. 2, an end view of one of these methods, together with the improved stamping or compressing apparatus, which will be more particularly described hereafter, under the second head of the invention. The mixing apparatus, shewn in figs.

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1, and 2, consists of a cylinder *a*, *a*, made of strong plate-iron, and mounted on a horizontal shaft *b*, *b*, which turns in suitable bearings *c*, *c*, placed at each end. On the right-hand end of the shaft *b*, *b*, is mounted the toothed wheel *d*, into which gears the endless screw *e*, of the horizontal shaft *f*, *f*, which is made to revolve by means of a steam-engine, or any other motive power. The iron cylinder *a*, *a*, is open at its ends, but revolves against, and is fitted to the end plates *l*, *l*, which form its ends. It is heated by a fire in the furnace *g*, *g*, and is caused to revolve slowly on its axis, by the endless screw *e*, gearing into the toothed wheel *d*, as before mentioned. The ingredients of which the artificial fuel is to be composed, are those generally employed for this purpose, namely, pitch, and small coal. These materials are first to be crushed, ground, or reduced to a fine powder; then mixed together, and placed in the hopper *h*, from whence they fall into the revolving cylinder, which, by its rotation, and being exposed to a regular heat, intimately mixes the ingredients together, and gradually softens and heats the whole mass, without charring any part. When this object is effected, the door *i*, at the right-hand end of the cylinder, is to be opened, and the whole charge withdrawn into any suitable receiver, from whence it is removed to the stamping apparatus.

Fig. 3, represents a longitudinal section of another construction of mixing apparatus, which is a modification of that above described. In the interior of the revolving cylinder is a longitudinal stationary shaft, furnished with lateral arms *j*, *j*, *j*, which carry or support a long scraper *k*, *k*. The arms and scraper are fixed, but the cylinder revolves slowly over a fire, as in the former instance; and as the edge of the scraper *k*, *k*, is contiguous to the internal surface of the cylinder, it scrapes off any of the ingredients contained therein, that may happen to adhere thereto, and causes them to fall down.

The end edges of the revolving cylinder, in this, as well as in the other apparatus, are fitted to end plates *l*, *l*, against which the cylinder revolves, as will be seen by inspecting figs. 1, and 3. In fig. 3, instead of the cylinder being mounted on, and attached to, the longitudinal shaft, this shaft is stationary, and the cylinder is mounted on hollow axles *m*, *m*,

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through which the shaft passes, as seen in the drawing. The longitudinal shaft is made in the form of a screw bolt, having a head *n*, at one end, and a screw-nut *o*, at the other; and, by screwing up the latter, the shaft may be held quite tight against its supports *p*, *p*. The hollow axle *m*, of the cylinder, is furnished with a toothed wheel *d*, by means of which rotary motion is communicated to it, in the manner shewn in fig. 1. The pulverized materials, of which the artificial fuel is to be composed, are fed into the cylinder through a hopper, as in the former instance. In this apparatus, the cylinder is not charged at once, but the materials are fed in from the hopper *h*, in a thin stream; and as the cylinder revolves, and the scraper turns over that portion of the ingredients which adhere to its sides, all the contents soon become intimately mixed together, thoroughly warmed and softened, and brought into a proper state and consistence to be conveyed to the stamping apparatus. The exit aperture or door *i*, of the cylinder, is always kept open, and by the rotation of the cylinder, the materials are continually made to fall out into the receiver; and in order to facilitate this delivery of the charge, and bring it towards the aperture *i*, the cylinder is placed on a slight inclination, the exit end being about three inches lower than that at which the ingredients enter.

The second head of the invention, viz., the stamping apparatus, is also shewn in figs. 1, and 2. The stamper, which is of considerable weight, is seen at *q*, *q*; it is suspended and moved up and down between guides *r*, *r*, (formed on the side framing,) by means of the cord or chain *s*, which, when the weight is up, is coiled round the grooved pulley *t*, to which it is also attached at one end. On the same axle as the large pulley *t*, is mounted a smaller pulley *u*, over which passes a band or belt *v*, from a similar pulley *w*, on the shaft *f*. The band *v*, is passed loosely round the two pullies *u*, and *w*, but may be tightened thereon by raising the roller *x*, and pressing it against the under side of the band. The roller *x*, is mounted on the shorter end of a lever *y*, which turns on a pin or stud *z*, as its fulcrum; to the other end of this lever a

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connecting rod 1, is attached, the lower end of which is jointed to a hand-lever 2, below. This lever has its fulcrum at 3, and as it is depressed by the workman, it draws down with it the longer arm of the lever *y*; thereby raising the roller *x*, at the opposite end, and causing it to press against the band *v*, and tighten it round the pullies *u*, and *w*; by which means, rotary motion will be immediately communicated to the large pulley *t*, and thereby cause it to coil the cord or chain *s*, round its periphery, and raise the weight or stamper. When the stamper is thus raised to the required height, the workman loosens the band *v*, by raising the hand-lever 2, and the stamper immediately descends by its own weight; he then depresses the hand-lever again, and thereby again tightens the band; the stamper then immediately ascends, and is ready to make another blow. One of the guides *r*, *r*, on the side standards, is furnished with a catch 4, which may be pushed out, when required, for the purpose of holding up the stamper, when not in use. The moulds are placed by hand, one by one, between the standards, under the stamper, and are filled from the cylinder; and when the contents of one are sufficiently compressed, it is removed, and replaced by another. If the workman at the hand-lever should neglect to depress it, and thereby loosen the band *v*, a projecting rod 5, connected to the top of the stamper, will raise the longer arm of the lever *y*, and thereby effect this object, without his assistance. A similar projecting arm may be placed on the other side, and made to strike a bell, and warn the attendant that he must relax the band *v*.

From the foregoing description, it will be evident that almost any kind of blow can be given that may be desired, from a quick succession of small blows, up to one or two very heavy finishing blows.

The patentee claims, Firstly,—mixing the ingredients, (of which any description of artificial fuel is generally or may be composed,) in a revolving cylinder, by means of which the ingredients are intimately amalgamated, and may be exposed to heat, without charring, and with a much less power than is required with the ordinary pug-mill; and Secondly,—the

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apparatus, above shewn and described, for stamping and compressing artificial fuel.—[*Inrolled in the Petty Bag Office, April*, 1843.]

Specification drawn by Messrs. Newton and Son.

To JOHN HEMMING, *of Edward-street, Cavendish-square, in the county of Middlesex, Gent., for certain improvements in gas-meters.*—[Sealed 16th July, 1839.]

THE meters, with few exceptions, employed for measuring and registering the quantity of gas delivered for consumption, contain water, or other liquid, which should always be at a certain level within the meter, otherwise the register will indicate a quantity greater or less than has actually passed through, in proportion as the quantity of liquid in the meter is greater or less than required. In addition to this evil, it sometimes occurs, that the water becomes frozen, and prevents the action of the meter from continuing.

The present improvements consist in the employment of a mode, hereafter described, for maintaining the liquid at an uniform height in the meter, and also of the use of a liquid or liquids not liable to freeze at the freezing point of water; and lastly, in protecting the brass or other metallic parts of the meter from corrosion, by the voltaic or chemical action which is so frequently destructive thereto.

To maintain the liquid at an uniform height within the meter, a supplementary cistern is added to the meter, as represented in the drawing, Plate XV., and marked *a*, and *b*. This is divided into two portions, the lower of which communicates, by two pipes *c*, and *d*, with the meter. The upper pipe is attached to the aperture over which the liquid should flow when the meter is sufficiently full. The upper portion of the cistern is provided with an aperture, which may be closed perfectly air-tight, with a screw and leather washer of the usual kind. There is a tube of glass or metal fixed in the upper portion of the cistern, which passes through an aperture, made air-tight by means of solder, or cement, or

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by passing through a pierced cork, inserted tightly into the aperture, and terminates as little below the proper level of the liquid as possible, (see *e*, in the drawing). The lower cistern is provided with a pipe of glass or metal, curved and recurved; the lower end of which passes through the bottom of the cistern, while the upper end terminates or opens at the line where the proper level of the liquid ought to be, as at *f*.

In filling the meter with liquid, in the usual way, it will enter the lower part of the supplementary cistern, and stand at the same level therein as in the meter, until it rises above the level of the pipe *f*, when the excess will be discharged through that pipe. The screws, previously removed to fill the meter, may now be fastened, and the liquid remaining in the bent pipe will prevent the admission of air to the cistern or meter. The upper part of the cistern is now to be filled with liquor; the aperture in the tube being closed, during the operation, by a plug of a conical form. For this purpose, the handle of a common paint-brush may be employed. The screw must then be immediately fastened, to prevent waste of liquid. If, after the meter is charged with the proper quantity of liquid, a farther and unnecessary portion should enter, which is sometimes the case, it will rise above the aperture of the pipe *f*, and the superfluous quantity will be spontaneously discharged. If there be any loss of liquor in the meter, arising from evaporation, or from other causes, the level will fall below the aperture of the tube *e*, by which air or gas will pass through it, and a corresponding volume of liquid will fall from the upper portion of the cistern *a*, to the lower *b*; and thus the level of the liquor will be uniformly preserved, so long as there is liquor in the upper part of the cistern *a*.

To prevent loss by evaporation or freezing of liquor, during cold weather, the patentee employs a solution of chloride of calcium, or muriate of lime, which is not so liable to evaporation as water, and which does not freeze until cooled considerably below the freezing point of water; or he places in the meter, and lower portion of the cistern, a solution of common salt; and as only the aqueous portions of this will eva-

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porate, the upper part of the cistern is filled with pure water. In order to protect the metals in the meter, liable to corrosion by voltaic or chemical action, pieces of zinc are attached, by solder or rivetting, to those parts most likely to be affected; it being well known that zinc protects other metals, less oxidable than itself, from chemical action, when exposed to fluids which cause chemical action.

The patentee claims, Firstly,—the mode, herein described, of maintaining an uniform level of fluid in gas-meters. Secondly,—the combining of a fluid, not liable to be acted on by the cold, (to which gas-meters are liable,) with such apparatus for maintaining the uniform level of fluid in the meter as above described; Thirdly,—the application of a solution of chloride of calcium, or muriate of lime, in gas-meters, to prevent the prejudicial effects of frost, as above described; and Lastly,—the application of zinc to protect the brass or other metal parts of meters, liable to corrosion, as above described.—[*Inrolled in the Inrolment Office, January*, 1840.]

To WILLIAM NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improvements in machinery or apparatus for picking and cleaning cotton and wool,—being a communication.*—[Sealed 15th March, 1841.]

THIS invention consists in various improved methods of constructing machinery for picking and cleaning cotton and wool, so as to cause a number of edges or points, upon a revolving cylinder, to strike, in rapid succession, against the material under operation, in order to separate from the fibres all foreign matters, by an operation analagous to that of picking them out by hand.

In Plate XIII., fig. 1, is a perspective view of the machine, shewing the ginning or cleansing apparatus, under one of its modifications; and fig. 2, is a longitudinal section of the same. The frame of the machine A, A, may be made of wood, to sustain the bearings of the respective cylinders and

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rollers. The feeding is to be effected by means of an endless apron B, which passes round two rollers C, C; and a top or pressing-roller D, turns freely in slotted bearings, in the usual manner,—the rollers C, D, being either plain or fluted. The wool or cotton, as it is fed in between the rollers C, D, is taken by the rows of points or teeth *a*, *a*, *a*, on the revolving picker-cylinder E, and delivered on to rows of fine combs *b*, *b*, set round the cylinder F, which is denominated the fine comb-cylinder. This cylinder is fluted or channelled, in the direction of its axis, to receive the fine combs *b*, *b*, of which there may be eight, ten, or twelve rows, more or less. The teeth of these combs consist of steel points, which may be about an eighth of an inch long, and the same distance, or less, apart. They slope backward, in the direction of the rotation of the cylinder, as shewn in the section, fig. 2. The teeth may be inserted into strips of brass, or other metal, let into the periphery of the cylinder; their points being nearly flush with the surface of the cylinder. G, is a fluted or indented roller, by which the burs, seeds, and motes, are to be beaten, picked, or separated from the wool or cotton. This roller, the axle of which is supported by the standards H, H, is so placed, that its projecting edges shall come nearly into contact with the fine comb-cylinder; and, as it revolves in the same direction with that cylinder, the edges of the flutes or indentations come into contact with the seeds, burs, or motes, held in the fibres, on their being brought up by the combs, and thereby strike them off, or pick them out, without injury to the fibres with which they were entangled; there being no more space allowed between the roller G, and cylinder F, than is necessary for the passing of the fibres. The teeth *a*, of the picker-cylinder E, which feed the cotton or wool on to the fine-tooth cylinder, serve also to throw down forcibly the dirt and other foreign matter detached by the fluted roller; which matter passes out through the grating J, J, below, and falls under the machine. As the cylinder F, revolves, carrying the cleaned fibres upon its points, they are brought into contact with the brush of the doffer-cylinder I, which clears the fibres from the teeth *b*, and prepares them to receive fresh supplies of wool or cotton from the points *a*, as before.

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Different shapes may be given to the edges and flutes of the beater G; but it has been found, that when the flutes are made along a solid metallic cylinder, in such a manner that its periphery shall, in its transverse section, resemble the teeth of a circular saw, its operation is most perfect. For the same purpose, a cylinder may be employed, with strips of metal extending from end to end, as shewn, on an enlarged scale, in the transverse section, fig. 3.

Fig. 4, represents another modification of the beater G; in this, *d, d, d,* are strips of metal, inserted edgewise into a cylinder, and extending from end to end, so as to present projecting edges, similar to those of the fluted roller G, in figs. 1, and 2. The respective cylinders are driven by pullies and bands, in preference to any kind of gearing. F, F, are the fast and loose pullies on the driving-shaft.

The claim made by the patentee, under this modification of the above-described machine, is the employment of a revolving fluted or channelled cylinder, having longitudinal ribs or elevations, like those herein described and represented, and marked G; or of any analogous revolving apparatus, which will present, in rapid succession, a number of beating, picking, or clearing edges, to operate upon the burs, seeds, or motes, held in the fibres of wool or cotton, presented to their action by means of an apparatus, constructed substantially in the manner herein set forth.

Fig. 5, is a plan view of a modification of the machine, arranged suitably for employing what is denominated an angular toothed guard, lying over, and nearly in contact with, the fine comb-cylinder, which is so constructed as to arrest, and partially separate the burs and other foreign matter from the fibres; their separation being effected by beating off, by the points or teeth of what is called an intersecting toothed cylinder. In this machine, a feeding apron and its appendages are used, as in fig. 1; but the apron and its outer roller are omitted in fig. 5. The shaft of the inner roller of the apron is seen at C, and its superincumbent or pressing-roller at D. The picker-cylinder E, is similar to that in fig. 1; but it is represented as larger, in proportion to the other parts. F, is the fine comb-cylinder; this cylinder and its combs being

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similar, in all respects, with those used and described in the first modification. I, I, are doffing-plates, which operate in the same way with, and may be employed in lieu of, the brush-cylinder, shewn in fig. 1. K, is the angular toothed guard, by means of which, and of the teeth on the intersecting toothed cylinder N, the burs, seeds, motes, or other foreign matters, are to be separated.

The angular toothed guard is formed in the following manner:—In figs. 6, and 7, M, M, represent a portion of that part of the guard which lies over, and nearly in contact with, the fine comb-cylinder; it consists of a plate of tempered steel, (such as is used for saw-plates being best adapted to the purpose). This plate must be of the same length as the fine comb-cylinder, and it is to have angular teeth upon one of its edges, along its whole length, as shewn at *f*, *f*. In the angles produced between the teeth, openings or slots *g*, *g*, are to be cut through the plate; and it is to be curved or bent inwards, so as to adapt itself to the curvature of the fine comb-cylinder. Ribs of cast-iron *h*, *h*, are attached to the upper side of the plate M, midway between the outer edges of each tooth, and extend from the points to the upper ends of the slots *g*, *g*, or to the rod or bar L, L, to which the steel and iron plates are affixed. In ordinary use, these plates are about half an inch thick, excepting towards their outer or lower ends *j*, *j*, where they are chamfered, so as to correspond with the form of the teeth in the steel plate. These chamfered parts of the ribs should be allowed to stand a little within the slope of the teeth, as shewn in the drawing, as the steel plate will then operate better in separating the burs and other foreign matter, than when the iron and steel teeth are flush with each other. To prevent the fibres from passing between the steel and the iron plates, at their points, it will be best to allow the extreme points of the teeth of the steel plate to be imbedded in those of the iron; the latter being elongated and notched for that purpose.

N, fig. 5, is the intersecting toothed roller or cylinder, the teeth of which are set in a spiral direction round it, so as to act successively upon the material to be picked; and they are placed an inch apart, or at such distance as to correspond

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with the slots *g*, *g*, in the steel plate M, M. The teeth must be of such length as to enable the cylinder to revolve clear of the ribs *h*, and to allow them to enter the slots *g*, *g*. The cylinder N, N, is made adjustable, so that it may be raised or lowered, and that its teeth may enter to a greater or less depth into the angular toothed guard, which is also adjustable endwise. O, O, are adjusting nuts, which fit on to screws at either end of the bar L, L, of the guard, and bear against the standards *k*, *k*, that support it, allowing sufficient endplay for the necessary adjustment; the lower ends of these standards embrace the gudgeons of the cylinder F. The nuts O, O, serve also to regulate the depth or distance to which the intersecting teeth of the cylinder N, shall enter the steel plate of the guard; *l*, *l*, are bridles, embracing the axles of the cylinder N, and through longitudinal slits in which the ends of the bar L, L, pass, in a manner more clearly shewn in fig. 8, and by which the nuts O, O, are made to regulate the distance of the cylinder N, from the guard.

Fig. 8, is a side view of the machine, shewing the manner in which the respective cylinders may be driven, by means of pullies and bands. P, is a pulley, fixed on the shaft of the picker-cylinder E; to which shaft may also be appended a loose pulley, and to these the strap from the driving power may be applied. On the opposite end of this shaft is a pulley Q, fig. 5, and on the shaft of the fine comb-cylinder F, is a pulley R, upon which the belt S, operates. In fig. 8, *m*, *m*, is a band from a pulley on the shaft of the picker-cylinder, which gives motion to the pulley *n*, on the shaft of the cylinder N; and *o*, *o*, is a band from the pulley P, which drives the brush-cylinder, or the doffing-plates I, I. A pulley *p*, on the shaft of one of the feeding-rollers, gives motion to the endless apron, being driven by a band *q*, *q*, connected with the pulley *r*, on the shaft of the fine comb-cylinder, through the intermediate pulley *t*, and the band *u*, *u*. T, T, are the standards that support the intersecting toothed cylinder N; and these can be raised or lowered by means of a set-screw *v*, passing through a slot in the lower portion of each standard.

In operating with this machine, as the fine comb-cylinder brings the wool or cotton, with its burs or motes, into con-

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tact with the sloping edges of the teeth of the angular toothed guard, the burs, or other foreign matter, are gradually acted upon by them; their inclined position preventing any sudden action that might injure the fibres, and gradually separating such foreign matter, as it approaches the points of the two contiguous teeth. The burs, seeds, or motes, are there met by the points of the teeth of the intersecting toothed cylinder, by which they are completely separated from the fibres, are beaten back, and fall down under the machine, passing between the grating at the under side of the picker-cylinder, shewn at J, in fig. 2.

The patentee claims, under this second modification of machinery, the manner of constructing what is denominated the angular toothed guard, and its combination with the revolving intersecting toothed cylinder; the angular toothed guard lying upon the fine comb-cylinder, and separating the burs and other foreign matters by the action of the oblique edges of its teeth; and such foreign matter being finally beaten off by the revolving intersecting teeth of the cylinder N, as herein set forth; the respective parts being made adjustable, and being constructed and arranged suitably for operating effectively, in the manner described.

Fig. 9, is a longitudinal section of the machine, so modified as to dispense with the fine comb-cylinder, used under the two former modifications; and also with the fluted or channelled cylinder, used under the first; and with the angular toothed guard, and intersecting toothed cylinder, used under the second modification; and substituting therefor a vibrating cleaning cylinder, by the aid of which, and its appendages, the burs and other foreign matters are separated from the fibres of wool or cotton. A, A, is the frame of the machine, and B, the endless apron, passing round rollers C, C, in the ordinary manner. Instead of allowing the fibres to pass directly from the feeding-apron to the picker-cylinder E, a pair of feeding-rollers D, D^1, may be employed, as is frequently done in other machines. The roller D, in this case, takes the place of the pressing-roller, shewn in the two former modifications. The picker-cylinder E, is set with teeth or spikes *a*, *a*, *a*, over a small portion only of its surface; there being

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usually but three or four rows, placed near to each other, so as to occupy one-sixth, or one-eighth of its periphery; the remaining portion being left plain, as the wool or cotton is to be fed to the vibrating, cleaning, or separating-cylinder, at intervals only. F, is the vibrating cleaning-cylinder, which stands at a short distance from the ends of the teeth on the picker-cylinder, and upon its periphery are affixed two or more combs *b*, *b*, made of plates of steel, which are to be bent and worked off true to the curvature of the cylinder. Along one edge, or both edges of these plates, are formed comb-teeth, which may be about a tenth of an inch apart, and an eighth of an inch deep, more or less; these are to be sharpened up, bevelling from the under sides of the plates, so that their points will be flush with their outer faces. When these plates are screwed in their proper situations, strips of paper or pasteboard, should be placed below them, so as slightly to raise them from the cylinder, in order that the teeth may readily take hold of the wool or cotton. To cause the vibrating cylinder to bring a portion of the wool back, and work it to and fro, when necessary, teeth are formed on the back edge of one or more of the comb-plates, by which means the desired effect is produced.

Above the vibrating-cylinder is placed a regulating guard L, which extends from end to end of the cylinder, and may be raised or lowered by set-screws *d*. Along the lower edge of this regulating guard there is affixed a steel plate *c*, *c*, armed with teeth, similar to those on the comb-plates of the cylinder F; the said teeth pointing towards the front of the machine, where the picked fibres escape. These teeth lay hold of the wool or cotton that has been carried forward by the comb-teeth *b*, *b*, and retain it until the fibres have been completely passed through.

The wool or cotton, being placed on the endless apron, is fed, at intervals, on to the comb-plates of the cylinder F; the teeth on the picker-cylinder not being allowed to come nearer than the distance of about half an inch from the vibrating-cylinder, so that too large a quantity of the fibres cannot be held upon the comb-teeth. The vibration of the cylinder F, must be to that extent which will carry the whole

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of the wool or cotton, held upon the teeth of the comb-plates, to the front of the machine, beyond the teeth upon the guard-plate; these teeth preventing its return. As the cylinder F, vibrates forward, the burs or seeds are detained by the edge of the guard-plate, and on its return they fall off, and pass down through the grating J, J, in the usual way. Those portions of the fibres which are not at once perfectly cleaned, are subjected to a loosening and picking operation, by the vibration of the cylinder F; and thus the wool is perfectly cleaned from burs or other foreign matter, and the cotton separated from its seed without injury to the fibre. The picker-cylinder, and its appendages, may be enclosed by a cover *e*, *e*.

The patentee claims, under this last modification, the manner of applying and using the vibrating-cylinder or doffer, with its comb-plates, constructed and operating as herein set forth, in combination with the toothed guard-plate, as described; and whether the respective parts be formed exactly as herein represented, or in any other way which is substantially the same, producing a like result by analogous means.—[*Inrolled in the Rolls Chapel Office, November*, 1841.]

Specification drawn by Messrs. Newton and Son.

To CHARLES PAYNE, *of South Lambeth, in the County of Surrey, chemist, for improvements in preserving vegetable matters, when metallic and earthy solutions are employed.* —[Sealed 9th July, 1841.]

THIS invention consists in preserving wood or other vegteable substances, by impregnating them with a solution of metallic or earthy matter, by means of exhaustion and pressure; and then, by chemical decomposition, obtaining the preserving matters in an insoluble state, within the substance of the vegetable material under operation.

The wood, or other vegetable substance, is placed in a strong vessel, and the air is exhausted therefrom, as well as from the interstices of the vegetable substance, by air-pumps, or other means; the vessel is then filled with the metallic or

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earthy solution, proposed to be employed, (or the vessel is nearly filled with the solution, in the first instance, and then exhausted of air); and, after standing for a short time, the solution is caused to enter into the pores of the vegetable substance, by means of force-pumps, or columnar pressure. It is found desirable to withdraw a quantity of the solution, from time to time, keeping up the pressure of supply; and, when the vegetable substance is sufficiently impregnated, the solution is drawn off from the vessel, and the latter is re-filled with a solution suitable for decomposing the matter of the previous one, by double or single decomposition, according to the result desired to be obtained.

As there are many metallic and earthy matters which are known as preservatives of vegetable substances from decay, and from burning with flame, the patentee does not confine himself to any particular solutions; but, in order to illustrate his invention more clearly, he states, that (with respect to metallic solutions) if the vegetable matter be impregnated with a strong solution of sulphate of iron, either hot or cold, he forces into it, by exhaustion and pressure, a solution of any of the carbonate alkalies, or of any other substance that will decompose the salt, and render the oxide of iron insoluble. With regard to earthy matters, supposing the vegetable material be impregnated with a strong solution of alum, he decomposes it by the employment of a solution of carbonate of soda, of a suitable strength for that purpose; or any other well-known means of decomposing the solution may be used, for the purpose of precipitating the alumina.

In some cases it is desirable to dry, or partially dry, the vegetable material, between the processes of impregnating with the different solutions, for the purpose of obtaining the matters of the first solution in a more concentrated form, within the substance of the vegetable material, and in order to get rid of part of the aqueous matter therefrom, to facilitate the next process of impregnation and decomposition.

The patentee claims the mode of preserving woods or other vegetable matters, by causing them to be impregnated with a solution of metallic or earthy matter, and then, by chemical decomposition, to obtain the matters employed in an insoluble

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state, in the substance of the vegetable matter; when such effects are obtained by the combined processes of exhaustion, pressure, and decomposition, as described.—[*Inrolled in the Inrolment Office, January*, 1842.]

To CHARLES BOTTEN, *of Farringdon-street, gas engineer, for a certain improvement in gas-meters.*—[Sealed 16th December, 1840.]

THE object of this improvement is to keep the water in wet gas-meters at a certain fixed level, in order thereby to prevent the incorrect registration of the quantity of gas passed through the meter, which arises either from an excess or deficiency of water.

The improvement consists in constructing the meter with certain additions, as represented in Plate XV., by which the water will always be kept at its proper level (loss from evaporation exception); and should any excess of water be introduced, such excess will overflow into a waste or discharge-pipe.

Fig. 1, is a front view of the improved meter, partly in section; and fig. 2, is a transverse section, on the line A, B, of fig. 1. *a*, is the inlet, and *b*, the outlet-pipe for the gas; *c*, is a close chamber, formed at one end of the ordinary rectangular frame *d*, at the front of the meter, and containing the waste-pipe *e*;—*f*, is a pipe for the introduction of water, opening into a broad flat passage *g*, situated at the back of the chamber *c*, and leading into the interior of the meter. Within the frame *d*, is a pipe *h*, open at the top, and communicating, by an opening *i*, at the bottom, with the interior of the chamber *c*. The upper ends of the pipes *e*, and *h*, are at the same height as the proper water-level.

The water is poured into the body of the meter through the pipe *f*, and passage *g*, and flows through an opening in the centre of the meter into the frame *d*, in which it rises to the top of the pipe *h*, and then descends through it into the chamber *c*; as the water is added, it rises within the cham-

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ber *c*, to the top of the waste-pipe *e*; and this pipe being of the same height as the pipe *h*, any excess of water that may be introduced will pass off through it. In the drawings, the bottom of the pipe *e*, is closed by a screw-plug *j*; but the apparatus will work equally well if it be left open.

The patentee claims, as his invention, the improvement in gas-meters, consisting in the additions *c*, *f*, *g*, *h*, *i*, whereby the water may always be kept at its proper level, loss by evaporation excepted. And he claims also a right to vary the relative dimensions and positions of the said additions, and to modify or dispense with some of the same, according to convenience, as long as the general system of action, by which the said beneficial effect is produced, is not materially or essentially departed from.—[*Inrolled in the Inrolment Office, June,* 1841.]

To WILLIAM PONTIFEX, *of Shoe-lane, in the city of London, copper-smith, for an improvement in treating fluids containing coloring matter, to obtain the coloring matter therefrom.*—[Sealed 28th January, 1840.]

THE improvement, proposed under this patent, is to concentrate the coloring matter contained in various fluids, and required for dyeing, printing, and other manufacturing purposes, by evaporating, or partially evaporating, the fluid, in vacuo; and thus obtaining a highly concentrated coloring extract, or dye coloring powder, without the color being injured by carbonization, or other causes, arising from the ordinary method of applying heat.

The fluid is placed in an ordinary vacuum-pan, and heat having been applied thereto, in the usual way, the exhausting apparatus, connected with it, is worked more or less rapidly, according as the steam, which is to be drawn off, is more or less rapidly disengaged; a good vacuum being always maintained. If, for instance, a decoction of logwood is the fluid under operation, it should not be allowed to remain in the vacuum-pan until it arrives at a viscid state; but when so much of the water has been evaporated as to reduce the re-

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maining portion of the decoction to a state of hyper-saturation, it should be drawn off, and allowed to settle. The clear portion of the decoction is poured off, and returned to the vacuum-pan; the sediment is allowed to dry, and is put by in that state, until required for use; or it may be first reduced to a fine powder, in a mortar. Other fluids may be evaporated until they assume a viscid form; the extent to which the evaporation is carried, depending upon the intended use of the coloring matter.

The feature of novelty claimed by the patentee, is, concentrating the coloring matter contained in fluids, and required for manufacturing purposes, by applying heat to, and thus evaporating, or partially evaporating, the said fluids, in vacuo; whereby a highly concentrated coloring extract, or dye coloring powder, is obtained, without any injury to the color from carbonization, or other damage, inevitably occasioned by the application of heat, in the ordinary way; and it is also rendered more portable, as well as in a more pure state for use.—[*Inrolled in the Inrolment Office, June,* 1840.]

To Sir William Burnett, *Knt., Commander of the Royal Hanoverian Guelphic Order, of Somerset House, in the county of Middlesex, for improvements in preserving animal, woollen, and other fibrous substances from decay.*—[Sealed 19th March, 1840.]

This invention consists in preserving the above substances from decay, by impregnating them with a solution of chloride of zinc. The solution is composed of one pound of chloride of zinc to five gallons of water, and is contained in a wooden tank, or other suitable vessel; the tank should be about two-thirds full, and the solution allowed to stand from ten to twelve hours previous to use. The substance to be preserved is then immersed in the solution for a period varying from forty-eight to ninety-six hours, according to its density, and afterwards dried under cover.

The patentee claims, as his improvements in preserving

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animal, woollen, and other fibrous substances, from decay, the use of the solution above described, in the manner herein set forth.—[*Inrolled in the Inrolment Office, September*, 1840.]

To CHARLES KEENE, *of Sussex-place, Regent's Park, in the county of Middlesex, Gent., for improvements in producing surfaces on leather and fabrics,—being a communication.* —[Sealed 23rd March, 1840.]

THIS invention consists in applying an outer surface of India-rubber to leather, and articles made thereof, such as boots, shoes, &c.

The India-rubber is first prepared in the following manner:—One hundred pounds of it are reduced to small pieces, or thin sheets, and saturated, for about twenty-four hours, in two hundred pounds of turpentine, or any other known solvent of India-rubber. It is then passed through a pair of crushing-rollers, several times, and a sufficient quantity of lamp-black, or other coloring matter, is sifted upon it, to give it the required hue; when the whole has been worked into one uniform mass, of the consistence of tough dough, or putty, it is ready for use, and is kept, in this condition, in a reservoir of water.

The leather or skins to which a surface of India-rubber can be most advantageously given, are known by the names of doe-skin, buck-skin, wash-leather, and the like. A pair of rollers are used for applying the surface to the leather; they are preferred to lie horizontally, or on an inclined plane; and one of them is kept continually wetted, while the process is going on, to keep the India-rubber from adhering thereto. The edge of the leather is first introduced between the rollers, and then as much of the softened India-rubber as will cover it is worked into a long roll, (corresponding to the width of the piece of leather,) and laid in the hollow between the leather and the wet roller. A revolving motion being now given to the rollers, the leather passes through them, and the

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India-rubber is pressed into the fibres and pores thereof, leaving a smooth coat of flexible and water-proof material upon its surface. When dry, it may be embossed or gilt, using some material to give it a gloss, and remove the adhesive properties. The material employed by the patentee, for this purpose, is shellac, dissolved in spirits of wine, with a small quantity of Venice turpentine; two or more coats are applied, and, in some cases, after it is dry, the leather is passed through a pair of smooth or embossed rollers, or passed between smooth or embossed plates.

When the leather has been made into shoes, portmanteaus, and other articles, the India-rubber is used in a more fluid state, and applied by hand.

The patentee claims, Firstly,—the mode of preparing external surfaces of leather, and fabrics made therefrom, with India-rubber, (more or less dissolved,) as a finished dressing, as described; and Secondly,—the mode of employing water on the surfaces of rollers, when spreading India-rubber (more or less dissolved) on to the surfaces of leather, as above described.—[*Inrolled in the Inrolment Office, September*, 1840.]

To BERNARD AUBÉ, *of Coleman-street-buildings, in the city of London, Gent., for improvements in the preparation of wool, for the manufacture of woollen and other stuffs.*—[Sealed 7th May, 1840.]

THE first part of these improvements consists in substituting oleic acid for the oils hitherto used in the preparation of wool. This is the fluid product obtained from fatty matters, when the two acids, composing those matters, are separated; which separation is now largely practised by the manufacturers of stearine candles.

The oleic acid may be removed from the wool in the same manner as the oils usually employed; but the second part of the invention consists in using, for this purpose, an alkaline solution, so as to convert the oleic acid into a saponaceous

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product, which will be found particularly useful for fulling woollen cloths, in place of soap. The alkaline solution may be formed by dissolving as much soda of commerce as will be equal to half the weight of the oleic acid used in a quantity of water, about twice the weight of the wool to be cleansed.

The claims made by the patentee are, Firstly,—the mode of preparing wool by the use of oleic acid in such processes; and Secondly,—the mode of preparing wool by the use of oleic acid, when combined with alkali, in the process of removing it from the wool.—[*Inrolled in the Inrolment Office, November*, 1840.]

To GEORGE RITCHIE, *of Gracechurch-street, in the city of London, and* EDWARD BOWRA, *of the same place, manufacturers, for improvements in the manufacture of boas, muffs, cuffs, flounces, and tippets.*—[Sealed 1st October, 1840.]

THE first part of these improvements consists in substituting bags or cases, filled with air, for the ordinary stuffing of boas, muffs, flounces, and tippets; or producing the same effect by making the article air-tight, and inflating it; small inflated balls of India-rubber may likewise be used.

The second improvement consists in applying double cuffs to the wristbands of shirts, so that, one pair of cuffs becoming soiled, may be turned underneath, and the clean pair, which were previously doubled back upon the arms of the shirt, exhibited.

The patentees claim, Firstly,—the mode of packing or filling boas, muffs, flounces, and tippets, with air; and Secondly, —the mode of applying double cuffs to the wristbands of shirts.—[*Inrolled in the Inrolment Office, April*, 1841.]

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Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 296, Vol. XXIII.)

April 11th, 1843.

JOSHUA FIELD, V.P., in the Chair.

No. 575. "Description of a cast-iron Reservoir erected at Garnet Hill, by the Glasgow Water-works Company."

By D. Mackain, M. Inst. C. E.

A CONSIDERABLE extension of the city of Glasgow is now taking place to the north-west of the old town, at an elevation of upwards of 100 feet above the river. The water-works, which are situated to the east of the city, are already upwards of four miles distant from the extreme point of delivery, which is almost daily becoming more remote, and the cost of the supply of water is consequently increased. These circumstances rendered necessary the establishment of a new reservoir, which should be sufficiently high and capacious to command and to supply the district. The ground which was obtained for this purpose was on the declivity of Garnet Hill, and had a fall of 20 feet in 90 feet extent. It was necessary to keep the bottom up as high as possible, and yet not to contract the space by thick walls, and to erect such a building as should not be offensive to the neighbourhood: these considerations induced the author to recommend the use of iron plates for the reservoir, which should be masked by a screen of masonry, designed by Mr. James Smith, architect of Glasgow.

The construction is thus described:—A bearing wall of 4 feet 6 inches in thickness was carried up from the foundation all round to within 1 foot of the floor of the reservoir. A division wall was built across the centre, to carry the partition for dividing the reservoir into two parts. The space within these walls was filled in with broken stones, over which was a layer of clay, and then a layer of sand, upon which was placed a flooring of Arbroath pavement, well jointed with cement, and resting at the sides upon the flanches of the sole plates, which were bedded in a mixture of lime and Roman cement, in such proportions as afforded ample time for the adjustment to be completed. The

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lower tier of plates was 1 inch, and the upper tier 11-16ths of an inch in thickness. Their flanch-joints were made secure by inserting between the faces a lead pipe, $\frac{3}{8}$ of an inch diameter, filled with lint-gasket, soaked in red lead and tallow; in addition to which the whole was caulked with a composition of hot lime and linseed oil, which in a short time became very hard.

The reservoir is 123 feet long by 85 feet 6 inches wide, and 13 feet 2 inches in depth; it is entirely covered by a malleable iron roof, supported upon cast-iron pillars.

The paper is illustrated by two drawings and four lithographs, giving the dimensions of every part of the work, and by a specification of the mode of execution.

Mr. Simpson said, that he had examined the reservoir very carefully, and could bear testimony of the excellent manner in which the work was done. The mode of construction was novel, and had succeeded perfectly, as no leakage had occurred since its erection, nor had any inconvenience arisen from the variations of temperature, or from the unequal depths of water in the two compartments. He thought Mr. Mackain was entitled to much credit.

Coradino Tank at Malta.

A drawing of the Coradino Tank, erected in 1841-2, in the island of Malta, was presented by William Lamb Arrowsmith, Assoc. C. E. (Superintendent of Government Works at Malta.)

It was described as the largest modern covered tank in Europe; its cubic contents being 700,000 feet; and with its settling reservoir, it would contain 15,000 tons of water; the roof was supported by rows of square pillars, 15 feet in height. It was intended to form a part of the works for supplying the island with water, a description of which was promised to the Institution to complete the paper on the supplies of water for cities, the first part of which has already been received.

Artesian Well at the Abbatoire de Grenelle.

A letter was read from the late Sir John Robison, giving a short account of the Artesian Well at the Abbatoire de Grenelle, Paris.

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The Abbatoire being at too high a level to obtain an adequate supply of water by the ordinary means, it was proposed, about eight years since, to sink an artesian well within the premises, which proposal having been agreed to, the execution of it was entrusted to Monsieur Mulot. The work having been perseveringly carried forward through many difficulties, the boring was terminated by the auger penetrating the water-bearing strata, on the 26th February, 1841, when a sudden and violent rush of water occurred, overflowing at the surface of the ground.

As the boring progressed, tubes of rolled iron, and subsequently of copper, were inserted to support the sides, the first being 12¼ inches diameter, and the lowest about 6½ inches diameter, reaching to a depth of 1794½ English feet. The quantity of water thrown up, while the bore remained in this state, was about 880,000 imperial gallons per day, at a temperature of 82½° Fahrenheit; the expense incurred up to this time being upwards of £12,000 sterling.

Sir John examined the theoretical reasons which had been given for the contortion of the tubes, which had been attributed to violent pulsations in the flowing water, acting upon the outside of them, crushing them inwards; he objected to this reasoning as not being in accordance with the laws of hydrostatic pressure, and attributed it rather to mechanical causes arising from the force used in forcing the tubes down the hole, and even more to the violence they were subjected to in being withdrawn from it.

The letter was illustrated by a lithographic section of the well, which was presented by William Cubitt, Assoc. C. E.

Mr. Cubitt had recently visited the well, and found the water flowing with considerable force through an orifice in the vertical pipe, about 8 feet beneath the level of the ground; the nozzle of the orifice, which was 10 inches diameter, was about half filled, and the stream was reported to be supplying about 2500 litres per minute, at a temperature of 82° Fahrenheit. The water was not clear; it deposited a considerable quantity of fine sand, and occasionally stones of about 2 inches cube were brought up. He was informed that the water had at one period ascended to between 70 and 90 feet higher than the ground.

Mr. Taylor observed, that the temperature of the water nearly coincided with that of the United Mines in Cornwall, which were 295 fathoms, or 1770 feet deep. The highest temperature re-

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corded there was, he believed, 96° Fahrenheit. It was well ascertained now, by the experiments of Mr. Fox, that the heat was not increased, either by the decomposition of the pyrites, or the number of men and horses employed in the mines.

Mr. Enys said, that the experiments by Mr. Fox, as published in the report of the seventh meeting of the British Association, gave a temperature of 92° in the lode, at a depth of 290 fathoms, where it was first reached in the cross-cut; but on proceeding along the same cross-cut, at 10 fathoms from the lode, the temperature decreased to 86° 3′, and at 24 fathoms distant it was 85° 3′: this would give a close approximation to the temperature quoted by Mr. Cubitt.

Mr. Braithwaite inquired at what depth the temperature began to increase: landsprings were generally at about 52°, and he found the water in wells 600 feet deep, usually at 53° or 54°. He had understood that the temperature increased 1° for every 65 feet, after a certain depth.

Mr. Enys said, that Mr. Fox's experiments gave a ratio of increase of 1° of temperature in 48 feet, calculated from the surface. He thought that the close approximation of the temperature of the landsprings, and that in the wells mentioned by Mr. Braithwaithe, might be accounted for by the rapidity with which the water filtered through the strata of the London basin.

Mr. Taylor agreed that the heat of the water was influenced by the nature of the strata; the Cornish miners, when they were taken to the North Welsh mines, were much inconvenienced by the coldness of the water in the latter, although the depth of the mines in both districts was nearly identical.

Mr. Braithwaite believed that his view of the temperature of wells would be corroborated by the coldness of the water in the new well at Southampton, which had now arrived at a very considerable depth, and he understood that the temperature of the water was about 54°.

Mr. Simpson said, that the well at Southampton had been sunk and bored to the depth of 1063 feet; the supply of water was not considerable, and he was not aware that any observations had been made as to the temperature. A well at Chichester had now arrived at the depth of 1013 feet, and was still being carried lower.

Mr. Sopwith contended for the accuracy of the investigations of Count Brenner, on the temperature of two German mines, and of Messrs. Fox, Buddle, and others, in England; the differences

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between the results obtained, were so trifling, as to induce confidence in the conclusion they had arrived at, which was, that after allowing for the radiation of heat at a certain distance from the surface, the temperature increased 1° for every 50 feet in depth. This law might not hold good in certain local basins, where from the nature of the strata the percolation of surface water was rapid, but in the extensive mining districts it certainly was correct.

Mr. Cubitt suggested that the close approximation of the temperature of the water in the well at Paris, and that observed by Mr. Fox at the same depth in Cornwall, might arise, in some measure, from the large volume of water in the former, and the rapidity with which it arrived at the surface; whereas in the deep wells which had been mentioned, the water had probably been allowed to cool before the temperature had been ascertained.

Mr. Clarke corroborated the opinion entertained by Mr. Cubitt: in a well, which he had sunk to the depth of 540 feet, at St. Alban's, he obtained, by an apparatus constructed for the purpose, some water from the bottom of the well, and found it 4° hotter than that which was pumped up from the same well. At the bottom of a well at Messrs. Barclay's brewery, 367 feet deep, the water was 3° hotter than at the water-level in the same well. Local causes frequently affected the temperature of water in wells; he had seen instances of the water being warmer at 60 and 70 feet deep than at 300 feet, but these cases would not influence the general law.

Mr. Vignoles considered the facts mentioned by Mr. Clarke to be very valuable, and as bearing out Mr. Cubitt's idea; there could be little doubt that if, by means of self-registering thermometers, the temperature of the water was ascertained, at the issue of the springs, at the bottom of deep wells which were not influenced by local causes, the result would prove in accordance with the observations of Fox and others. By the laws of the circulation of fluids, the heavier water, which had been cooled at the surface, mingled with the lighter and warmer water as it rose; the sides of the well also tended to abstract the heat: therefore, the temperature should be obtained at the greatest depth, in order to make any correct experiment.

Mr. Braithwaite agreed in the influence of local circumstances: in a well at Cheshunt, at a depth of 40 feet, a sulphureous spring issued, the vapour of which almost killed the workmen; and when at last it was built out, the bricks continued so hot, that

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the hand could scarcely be borne against them. Below that point very cold water was met with.

No. 556. "Description of the Water-pressure Engine, at Freyberg, Saxony."

By William Lewis Baker, Grad. Inst. C. E.

The machine described in this communication was designed by Herrn Brendel, in 1823, and constructed in 1824, for draining the "Alte Mördgrube" mine, one of the largest silver mines in the neighbourhood of Freyberg, in Saxony.

This engine, which is fixed at a depth of 360 feet below the surface of the ground, has two single-acting cast-iron cylinders, each 18 inches in diameter, and 9 feet stroke; to the pistons of which are fixed strong timber piston rods, each attached at their upper ends by a flat iron rod and chain, to the opposite segments of a horizontal working beam, thus connecting the pistons of the two cylinders; so that, when one is being moved upwards by the pressure of water underneath it, the other is depressed by the weight of all the pump-rods and other moving parts to which it is connected.

The admission and eduction of water from the cylinder is regulated by slide valves worked by levers and tappets. The piston-rods give motion to the horizontal arms of two bell-crank levers, the diagonal arms of which move the main pump-rods, working forty-four pumps, in two sets of twenty-two each, placed one above another, at an angle of 45° with the horizon, each dipping into the delivery cistern of the pump immediately below it; this is repeated downwards for the whole series; and thus the water is raised from the bottom of the mine to the point where it runs off by an adit. Each pump has a lift of 30 feet 4 inches. The duty performed by this engine is stated by Gerstner to be as 70 to 100.

The author then gives a very minute account of the construction of the engine, illustrating the paper by three drawings, giving the general arrangement, and the detailed dimensions of all the working parts.

Mr. Taylor remarked that the water-pressure engine was of

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Hungarian origin; it was extensively used in Germany, and had latterly been much improved in construction, particularly by abandoning the rude mode of placing a series of pumps over each other, as had been described in the paper.

He believed that Smeaton erected the first engine of the kind in this country. Trevithick built one about forty years since, with cylinders of 30 inches diameter. Another was erected by Mr. Fairbairn, and since then, one had been built, under the direction of Mr. Darlington, with cylinders of 50 inches diameter, and 10 feet stroke, worked by a force of water 22 fathoms, through a descending column of 30 inches diameter; the pumps, worked by the engine, were 42 inches in diameter, raising water from a depth of 22 fathoms; the usual speed of working was four strokes per minute, but he had seen it attain six strokes.

The concussion produced by the closing of the valve at the end of the stroke, was generally very prejudicial to these engines, but in that made by Mr. Darlington, it was diminished by allowing the large valve to close a short time before the stroke finished, and bringing the piston home with a small valve; by this means no noise was heard beyond that of the rush of the water, and the violent shocks were avoided.

No. 585.—*Screw-Cutting.*

Some specimens were exhibited of screws cut in lathes, constructed by Messrs. Shanks and Co., of Johnstone, near Paisely. They were sent by the late Sir John Robison, who described the principal advantages of the arrangement of the lathe for cutting them, to consist in the cutters acting during the incursion as well as the excursion of the slide, and when forming long screws, in their being alternately stayed on the side opposite to the tool which was in action; that by these means, good work could be produced with such dispatch, as to reduce the cost of turned screw bolts, as low as that of similar articles produced by screwing machines, which worked with dies acting by compression.

A drawing of the lathe used in cutting the screws, was presented with the specimens.

Mr. Field observed, that the machine was ingenious and ap-

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peared to do the work well; but as far as could be ascertained from the drawing, there was not any novelty in it. A similar machine, made by the late Mr. Maudslay, had been in use in Maudslay and Field's manufactory for the last fifteen years. The screwing dies, invented by Mr. Whitworth, cut out the threads of screws as clearly as if done by a chasing tool, and entirely without compression.

April 25, 1843.

The PRESIDENT in the Chair.

No. 116. "An Account of the Brick-making at Blechingley Tunnel, during the winter of 1840, and summer of 1841." By Frederick Walter Simms, M. Inst. C. E.

As the forming of this part of the Dover Railway was not let by contract, it was necessary to make extensive preparations previously to commencing the work; and amongst these the brick-making department was one of the principal, the whole being under the personal superintendence of the author.

The bricks were all made on the surface along the line of the tunnel, the brick-grounds being so arranged on each side of the shafts, that when the bricks were delivered from the kilns and stacked, but little labour was necessary to convey them to the spot, whence they were lowered to the underground works.

The mode of manufacture adopted was that of "slop-moulding," in which process the mould is dipped into water previous to its receiving the clay, instead of its being sanded, as is the case in making sandstock bricks; the workman then throws the clay with some force into the mould, pressing it down with his hands to fill all the cavities, and strikes off the overplus with a stick; an attendant boy, who has previously placed another mould in a water-trough by the side of the moulding-table, takes the mould just filled, and carries it to the floor, where he carefully drops the brick from the mould on its flat side, and leaves it to dry; by the time he has returned to the moulding-table and deposited the empty mould in the water-trough, the brick-maker will have filled the other mould for the boy to convey to the floor, where they are allowed to dry, and are then stacked in readiness for being burned in clamps, or kilns. Minute details of the manufacture

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are then given, the average results of which are shown in the following table:—

Force employed.	Area of Land.		Duration of Season.	Produce per Week.	Produce per Season.
	Roods.	Perches.	Weeks.	Bricks.	Bricks.
One moulder One temperer One wheeler One carrier boy One picker-up boy	2	14½	22	16·100	354·200

A careful comparison is then made between the two modes of sand-stock and slop-moulding, from which it appears, that while the production of sand-stocks is as 30 to 16 of the slop process, the amount of labour is as 7 to 4; and that the quantity of land required and the cost of labour per thousand, are nearly the same in both processes.

The bricks were all burned in close kilns, constructed with soft bricks set in pugged clay,—the quantity burned in them at a time varying from 30,000 to 40,000. The fuel employed was that known by the name of the Bell Robson Netherton, or South Hartley coals; and for the purpose of more accurately determining the cost of this element, the author caused the quantity of coals consumed in burning 94 kilns of bricks, to be carefully noted. This is given in a table accompanying the communication; the average of it is, that 10 cwt. 0 qrs. 8lbs. of coals were used in burning each thousand of bricks.

The floor of the drying-houses was made of pugged clay, about 9 inches thick at the furnace end, and gradually diminishing to 2 inches at the extreme, or chimney end, so as to equalize the heat of the floor. The temperature of the interior of these drying-houses, when in full operation, varied from 50° to 70° Fahrenheit.

The estimated cost of the bricks delivered at the shafts was £2. 1*s*. 10*d*. per thousand; but the actual cost, obtained by dividing the total expenditure by the whole number of bricks made, was only £2. 1*s*. 6*d*. per thousand, which includes waste and all other expenses that were incurred.

The paper is accompanied by two drawings, showing the elevations and sections of the kilns and drying houses with their flues.

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Mr. Bennett thought that the quantity of bricks which could be produced by each gang of men was underrated, for, at Cowley, the average number of sandstocks moulded was 32,000 per week; while his men very frequently made 37,000, and sometimes they reached as far as 50,000. The space occupied for moulding at Blechingley appeared small; in Mr. Bennett's brick-ground ten stools occupied twenty-acres; this might arise, in some degree, from more time being allowed for drying in the sandstock process: he believed this to be an advantage; the principal part of the shrinkage took place while drying previously to being burnt. The total amount of contraction in his bricks was 13-sixteenths of an inch in 10 inches; but all clays differed in the amount of contraction.

Mr. Farey directed the attention of the meeting to Hunt's improvements on the Marquis of Tweeddale's machine for making bricks; it had not, he believed, yet been brought into general use in England, but it was employed extensively at Hamburgh and other places on the Continent, and was stated to produce stronger and better shaped bricks, of more uniform quality than those made by hand moulding; the process was a kind of intermediate one between slop and sand-moulding; the moulds being wetted, as in the former process, while the clay was tempered in a pug-mill, as in the latter process.

Mr. Bennett said that the Marquis of Tweeddale's machine had not been adopted generally, because of the first cost, and that the necessity for employing horse power, or a steam-engine, for working them, rendered the bricks more expensive than when made by hand.

Mr. Homersham stated that steam or horse power was not indispensable; that Messrs. Simpson and Co. had made several of Hunt's machines for the Tweeddale Brick Company, to be worked by manual labour, and that they succeeded perfectly. He found the bricks so produced about one-sixth stronger than those made by hand, which he attributed to the degree of pressure to which they were subjected.

Mr. Simms objected to the use of machinery, chiefly because it would only effect an economy in the moulding, which was but a small part (about one-eighth) of the expense of making bricks.

The contraction of the bricks varied according to the nature of the clay employed; the moulds used at Blechingley were 10 inches long by five inches wide, and three inches thick, and the

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bricks when burned, were 9 inches long by 4¾ inches wide, and 2½ inches thick.

Mr. Bennett mentioned the existence of a brick machine invented by Mr. Ainslie, and now working in Scotland; it was, he believed, somewhat cumbrous, and required to be driven by steam power, but he had understood that it produced very good bricks and tiles, but was chiefly employed to make the latter.

In answer to a question from the President, Mr. Simms said, the bricks at Blechingley had been made without any cavity in the top and bottom, in order not to waste the cement in which they were laid. Engineers entertain very opposite opinions as to the utility of the cavity in the bricks.

Mr. Cubitt preferred the bricks having a cavity, if they were to be laid in mortar; with cement it was of less importance.

Mr. Farey believed, that when the cement was stronger than the bricks, cavities on the surfaces were desirable, but if the bricks were good and stronger than the cement, the cavities were not necessary.

Mr. Farey exhibited specimens of tiles, &c., made by Mr. Prosser, of Birmingham, and described the process of manufacture. The clay was first dried upon a slip kiln, as if for making pottery, then ground to a fine powder, and in that dry state it was subjected to heavy pressure in strong metal moulds; by this means it was reduced to about one-third of its original thickness, but the clay appeared to have contained sufficient moisture to give it cohesion, and the tiles retained the most perfect sharpness at the edges; they were then carried direct to the kiln, and baked in "saggers" or crucibles, without any previous drying, and they did not appear to crack in baking. A brick, of the usual dimensions, which was exhibited, had been made by this process from the common brick-earth of Staffordshire, ground fine: it was of a clear red color, and of homogeneous texture, and the edges were sharp; its weight was 6¾ lbs., and the specific gravity was 2·5. Mr. Farey stated, that this brick was not vitrified, but merely baked, and that it had acquired its density from the great pressure used, which was equal to 250 tons.

Mr. Pellatt had seen Mr. Prosser's machine at work, making buttons and other small objects; the ground clay appeared to retain a certain degree of moisture, which, combined with the pressure, gave it such tenacity, that, on leaving the mould, it could be handled and carried direct to the kiln; it was compressed to about one-third of its original thickness.

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The clay of the Staffordshire potteries contained chiefly silicate of alumine; it was principally valuable for, and was employed in, making "saggers" or crucibles, wherein the china was baked.

Mr. Blashfield stated, that of the specimens of Prosser's manufacture on the table, the small hexagonal tile, 3¼ inches diameter and three-eighths of an inch thick, had sustained a pressure of 30 tons, without the edges being crushed; another of the same diameter and 2⅛ inches thick, bore 35 tons, and the 9-inch stock-brick remained perfect under pressure of 90 tons: the largest sized slab hitherto produced by the process was 34 inches long, by 8 inches wide, and ¼ inch thick: but he believed that as soon as the new hydraulic presses were completed, it was Mr. Prosser's intention to make large bricks of varied forms for architectural purposes.

[*To be continued.*

ON THE LAWS RELATING TO LETTERS PATENT FOR INVENTIONS.

No. X.

THE PATENT LAWS OF SPAIN.

ALTHOUGH this fine but unfortunate country has, for the last thirty years, been continually distracted and convulsed by intestine broils, it appears that the Government has still found time and opportunity to turn its attention to fostering and protecting the arts and manufactures. Whatever form of Government happened for the time to be paramount, all persons appear to have agreed in the policy of encouraging this arm of national strength. We accordingly find that the protection of inventive genius, by giving enterprising and ingenious men peculiar privileges, called patents, is one among the many means that have been adopted to effect or assist this laudable object. A law, relative to patents for inventions, was decreed by the Cortes, on the 2nd October, 1820, and sanctioned by King Ferdinand the Seventh, on the 14th of the same month. This law is drawn up in a wise and politic manner, and is well worthy of the imitation of more civilized countries: it was, however, subsequently annulled by the same king, in 1823, in common with all the acts and decrees of the constitutional Government of Spain, as will be seen by the following extract from a decree, issued by Ferdinand, and dated 1st October, 1823, which says:—

"All the acts of the Government, called Constitutional, of

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whatever class and condition, which have governed my subjects from the 7th March, 1820, to this day, 1st of October, 1823, are null; declaring, as I do declare, that during all that time I have not been free, but have been obliged to sanction laws, decrees, and regulations, which were planned and issued against my will by that Government.

(Signed) " FERDINAND.
" A. D. VICTOR SAEZ.

" *Port Santa Maria, 1st October*, 1823."

Spain appears to have been without any Law of Patents from this time for two or three years, when a new law was enacted. This law, which is the Spanish Law of Patents, now in force, was enacted by King Ferdinand the Seventh, on the 27th day of March, 1826, and is as follows :—

ACT OF STATE.

Royal Decree, establishing certain Rules and Orders, in conformity with which, Royal Patents, or exclusive privileges, are to be granted for new inventions, or for the introduction, importation, or improvement of objects relating to the arts and manufactures.

As the best and most natural means of assisting and improving industry and the arts, is to encourage and facilitate the multiplication and improvement of machines, instruments, works of art, apparatus, and scientific and mechanical processes and methods; and as those new and improved means of production cannot reasonably be expected, unless their authors, introducers, and improvers, are protected and made secure in the property and enjoyment of the results of their ingenuity and application, by means of legal enactments, which, by stating and balancing the amount of protection necessary to be maintained between private interests and the public industry, shall protect the former from usurpation and infringement, and also prevent the evils which would be felt by the latter, in consequence of the concealment and monopoly of those inventions which are intended for its advantage; I have, therefore, thought fit to establish certain uniform regulations and orders, according to which, patents or exclusive privileges for the invention, introduction, and improvement of objects relating to the useful arts, of all kinds whatever, are henceforth to be granted; and having also, in reference to this subject, examined the Report of the Junta for the Encouragement of the Wealth of the Kingdom; and acting also upon the advice of my Council of State, I do resolve, that the following Articles shall be observed and kept :—

ART. 1st. Any person, of whatever condition or country, who proposes to establish, or shall establish, any machine, apparatus,

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instrument, or mechanical or chemical process or operation, which may be wholly or in part new, or which may not have been established in the same manner and form in these kingdoms, shall have an exclusive property therein, and use thereof, in the whole of the said invention, or in that part thereof which shall not have been before practised in these kingdoms, under the rules and conditions hereinafter mentioned; subject, however, to the laws, the royal ordinances, and the regulations and edicts of the police.

2nd. A Royal Patent of Privilege shall be issued for the exclusive use of an invention to any party interested therein, without previous examination as to the novelty or utility of the object, and without the grant being in any way considered as a recognition of its novelty or utility; and the party interested shall remain subject to the result, according to the conditions laid down hereinafter in this royal decree.

3rd. Royal patents of privilege shall be granted for 5, 10, or 15 years, at the choice of the petitioners, in case they solicit them for objects of their own invention; but only for five years, if they are solicited for importations from foreign countries; it being understood, that patents or privileges, granted for these last, (and which shall be called patents of importation or introduction) must be for executing and putting in practice some invention in these kingdoms, but not for bringing in articles ready made from abroad; as in such case, they shall be subject to the tariff and ordinances respecting the entry of merchandize and goods from abroad.

4th. A patent or privilege for any invention, when granted for five years, may, on good cause being shown, be further extended for a like period; but those granted for ten and fifteen years, cannot be prolonged.

5th. An invention or discovery, which has not been practised in Spain, or in any foreign country, shall be considered a proper subject for a patent of invention; and any invention or discovery not known in Spain, but which has been in use abroad, shall be a proper subject for a patent of introduction or importation. Nevertheless, all those foreign inventions, of which models or descriptions, in the Spanish language, are lodged in the Royal Conservatory of Arts, cannot form the subject of a patent or privilege, until three years have elapsed since their first introduction, without their being put in practice; in which case, a patent of importation may be obtained for the same for five years only.

6th. The parties interested must apply for the royal patent or privilege, either personally or by means of an agent, by drawing up a memorial or petition, in the proper form, and delivering the same to the Intendant of the province in which they (the petitioners) reside; or they may in all cases forward the petition direct to the Intendant of Madrid, if that course be preferred.

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7th. The memorial and other documents must be accompanied by, or consist of—1st, a representation, or petition, to my royal person, written on large-sized quarto paper, stamped, setting forth the subject of the application for which the patent is solicited, and whether it be the invention of the petitioner, or a foreign importation, and also the length of protection solicited, conformably to Article 3; this petition shall be drawn up literally, according to the proper form; and not more than one invention may be introduced into, or included in, one and the same application. 2nd, a plan, or model, with the description and explanation of the invention, specifying what is the peculiar mechanism or process which is claimed therein, as not having been hitherto practised; the whole being stated with the greatest precision and clearness, so that there may not be, at at any time, any doubt as to the identity of the invention, and of that peculiarity which is presented as hitherto unpractised in that form. On these conditions alone can the privilege be granted.

8th. The models must be forwarded in a sealed box, and the plans, descriptions, and specification, must also be enclosed therein, or else put up in paper, and sealed. In either case, a title in the proper form, must be indorsed on the same.

9th. The Intendant shall state, under the indorsement, that the documents have been presented, and shall sign it with his cypher, causing the box or packet to be sealed. He shall then give a certificate of the deposit to the party interested, and forward the packet, with a dispatch, to my Secretary of State, or to persons at his office, in order that the interested parties, or some person in their name, may hereafter take charge of the whole.

10th. When I think proper to grant a royal patent of privilege, the aforesaid documents shall be forwarded to my supreme Council of State, who are now charged with this description of business, which was formerly examined by the General Junta of Commerce, Coinage, and Mines; and there the boxes and packets, before mentioned, shall be opened, and the documents, contained therein, (as mentioned in Article 7) being found correct, a royal patent or privilege, of the kinds suited for the case, shall be issued in the regular manner and in the proper form.

11th. Before the delivery of the patent takes place, the parties must present a receipt, certifying that they have already paid into the Royal Conservatory of Arts such of the following duties as the particular case requires:—

For a patent for	5 years ..	1000 reals vellon	=	£10 sterling.
„	10 „ ..	3000 „	=	30 „
„	15 „ ..	6000 „	=	60 „
„	of introduction or importation ..	3000 „	=	30 „

and, in addition to either of the above amounts, the sum of

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80 reals = 16*s.*, shall be paid for the costs of issuing the royal patent.

12th. The patent being granted, the documents, enclosed and sealed, as aforesaid, shall be sent to the Royal Conservatory of Arts, where they shall remain deposited in an apartment provided for that purpose; and they shall not be opened except in case of litigation, and by virtue of the official order of a competent judge.

13th. The grants of all patents or privileges shall be published in the *Madrid Gazette*.

14th. In accordance with the provisions of the 6th and 21st Articles of the Royal Ordinance of 1824, by which a Royal Conservatory of Arts was established, a register shall be kept in that establishment; in which register all the royal patents that are granted shall be entered in chronological order, expressing the date, the names, surnames, and residences of the parties interested in the subject of the patent, and the term of its duration. This register shall be open to the inspection of all persons who may be desirous of examining the same.

15th. The proprietor of a patent shall enjoy the use and exclusive property of the invention for which it was granted; and no one shall be permitted to execute or practise the invention, without obtaining his previous consent, either for the whole, or for that part which he has declared to be new, and not before practised in these kingdoms, in the manner shown and described by him in the model, plan, and description, which he has deposited, and which may be brought forward in evidence at any future time.

16th. The priority of the patent, and exclusive right to, and property in, the invention, shall date from the day and hour on which the documents are deposited with, or presented to, the Intendant; and in case two or more persons shall have solicited a patent for the same invention, the patent of the person who first presents those documents, shall alone be valid.

17th. The right conferred by the patent may be transferred or assigned, given, sold, or exchanged, and left by will, in the same manner as any other personal property.

18th. Every transfer or assignment must be made public by a deed, which must state whether the transfer of the right extends to all the kingdom, or only for one or more of the provinces, or for particular towns and districts; also whether the transfer or assignment is absolute, or with any conditional clause, reserving the use of the invention to the proprietor, and whether or not it is with the power of again transferring or assigning the patent; and also whether the patentee has already transferred or assigned it, or a portion of it, to one or more persons.

19th. The person making the transfer or assignment shall be

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obliged to produce the deeds of transfer to the Intendant, to whom the application for obtaining the patent was made; and after having taken cognizance of, and made a memorandum of, the transfer or assignment, he shall transmit these particulars to the Council of State, who shall give notice, to the like effect, to the Royal Conservatory of Arts, in order that it may be entered in the register, mentioned in Art. 14. The transfer or assignment shall be null, if the evidence of the deed of transfer is not presented to the Intendant within thirty days after its execution.

20th. The duration of the patent right shall be computed from the date of the issue of the royal patent.

21st. The effect of the royal patent shall cease, and the exclusive privilege shall become null and void—1st, when the time, named in the grant, shall have elapsed; 2nd, when the party interested shall not present himself to receive the royal patent within three months of the day on which he presented his petition; 3rd, when he shall not have put the invention, for which the patent is granted, into practice, either for himself, or for another person, within a year and a day after the date of the patent; 4th, when the party interested abandons his invention, which will be understood and taken for granted, when he ceases to practise it for an uninterrupted space of a year and a day; 5th, when it is proved that the invention has been previously in use in any part of the kingdom, or described in printed books, or in engravings, pictures, models, plans, or descriptions, contained in the Royal Conservatory of Arts; or that it shall have been executed or established in other countries, the proprietor of the patent having presented it as new, and of his own invention.

22nd. When the time of the grant of the patent has elapsed, the Director of the Royal Conservatory of Arts shall give notice to the Council of State of the day on which the patent expires, and the Council will officially declare the expiration of the privilege.

23rd. In all the other cases, a competent judge shall proceed, at the suit of any party, to try the facts of the case; and if the cessation of the working of the invention, or other parts bearing on the question, are fully and credibly proved, the judge shall give notice to the Council of State that the cessation of the patent may be publicly declared.

24th. The judges, whose business it shall be to attend to these matters, shall be the Intendants in their respective provinces; memorials, or applications, may be made to the Intendant of the province wherein the defendant resides; and appeals shall be made to the Council of State.

25th. When a patent becomes void, for any of the causes mentioned in Art. 21, the box, or the packet of documents, deposited in the Conservatory of Arts, shall be opened by the

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Director of the same, and the whole shall remain open for public inspection; the expiration of the patent right being also announced in the gazette.

26th. The proprietor of a patent, obtained under any title whatsoever, shall have the right to cite, and to bring to judgment, before any of the competent courts, any and all persons usurping or infringing his right; and the Intendants of the provinces, wherein the defendants reside, shall take cognizance of these actions; and all appeals shall be referred to the Council of State.

27th. When the plea or fact of infringement has been proved, all the machines, apparatus, utensils, and works of art, made by the defendant, in violation of the patent, shall be confiscated; and he shall also be condemned to a fine of three times the value of the same; such valuation to be made by competent persons, and the whole of the fine and confiscated property is to be handed over to the proprietor of the patent, for his own benefit.

28th. The patents already issued, before this date, shall remain in force, subject to the conditions on which they were granted; and those which have been granted upon certain conditions, to be determined by this present royal decree, shall comply with the enactments hereof.

You shall hold these presents understood, and shall give suitable instructions for carrying them into effect.

Signed by my Royal Hand, at the Palace,
27th March, 1826.

To Don Louis Lopez Ballesteros,

Scientific Adjudication.

The advantages arising from a complete record of the decisions in cases of infringements of patents, must appear, to all persons interested in inventions, to be very great; but yet, from the difficulty, firstly, of knowing what cases are coming on, and, secondly, the expense of obtaining reports of the proceedings, in order to their publication, have been the cause of many important decisions remaining unknown to the public. We now propose to turn our attention more earnestly to this subject, and give as many and as full reports of such interesting scientific adjudications, as our opportunity of information and our space will allow.

The absence of any fundamental law, in the United Kingdom,

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to which the judicial authorities can refer, in confirmation of their opinions on patent cases, renders it a matter of very serious importance to the patentee and inventor, that the previous decisions of the various Courts—the substitute for law in such matters—should be well understood.

To the kindness of friends, many of whom, unsolicited, rendered their valuable assistance, we have been enabled to present our readers with some decisions of the greatest importance, which might otherwise have escaped general observation; and by a continuance of these favors, and a personal attendance in Court, when requisite, we hope to be able, in some measure, to fill the void which has so long been felt, not only by inventors, but also by gentlemen engaged in the legal profession.

The following cases, obtained from various sources, together with those which we shall publish in the following numbers of the Journal, were argued in the present year; but having hitherto escaped our notice, they are here, for the first time, collected and arranged in chronological order.

HOUSE OF LORDS.

March 6th, 1843.

HOUSEHILL COAL AND IRON COMPANY *v.* NEILSON AND OTHERS.

THIS was an appeal against the decision of the Court of Session, (Scotland,) with respect to the case of Neilson and others *v.* Househill Coal and Iron Company, which was tried before the Lord Justice Clerk, in the spring of last year; and judgment was now given by their Lordships.

The jury, in the case above referred to, returned a verdict in favour of the pursuers, with damages to the extent of £3060. But the defenders took thirteen exceptions to the law laid down by the Lord Justice Clerk, in summing up the evidence; and these exceptions were discussed in July last, before the second division of the Court of Session, who decided that the law objected to was correct, and accordingly disallowed the exceptions. The defenders then appealed to the House of Lords, against this decision; and, after being before the House for four days, judgment was given, confirming the decision of the Court on twelve of the exceptions, and altering it in regard to the remaining one.

The exception on which the House of Lords differed from the Court of Session, referred to the issue of novelty, on which the jury found in favour of the pursuers; although it was proved, in evidence, that certain unsuccessful trials, with heated air, had been made, and abandoned, at an iron work in England, in 1798.

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The direction of the Lord Justice Clerk, on this evidence, was excepted to, in so far as he directed the jury that the prior use of the patent invention must not only be public, but must have been continued, not abandoned; and must have been continued to the time when the patent was granted; not to the very exact period, but that it must have been known and used as a useful thing at the time. The House of Lords (as will be seen by the following quotations from the speeches of the Lord Chancellor, Lord Brougham, and Lord Campbell, on the subject) held that the above direction was erroneous in point of law, and that the judge should have left it to the jury to say, whether the facts, proved in evidence, amounted to a prior use, or to a mere experiment.

The Lord Chancellor.—My Lords, the principal question, in this case, arises out of the eleventh exception. The learned judge (who presided on the trial in the Jury Court) stated to the jury what he considered to be sufficient evidence to support prior use, so as to invalidate the patent. The learned judge expressed himself in these terms:—He says, "You will observe, that it is settled, that the trials founded on as a proof of prior use, must have been public—must have been continued, not abandoned—must have continued to the time when the patent was granted—I do not say to the very exact period, but it must have been known and used as a useful thing at the time." (After some observations on the meaning of the word "trials," as used by the presiding judge in the Jury Court, the Lord Chancellor continued)—I understand the proposition of the learned judge to be this—that if the machine had been made, and had been put in trial, unless those trials had gone on, and the machines had been used up to the time of the granting of the letters-patent, it would not be evidence of prior use, so as to invalidate the letters-patent. Now, I am obliged to say, with all deference to the learned judge, and with all respect to the learned judges of the Court of Session, that I think in that respect they are mistaken, and that if it is proved distinctly that a machine of the same kind was in existence, and was in public use; that is, if use, or if trials, had been made of it, in the eye, and in the presence of the public, it is not necessary that it should come down to the time when the patent was granted. If it was discontinued, still that is sufficient evidence in support of the prior use, so as to invalidate the letters-patent. If it is discontinued, provided it has been once in public use, and the recollection of it has not been altogether lost—if it has been once publicly used, it will be sufficient to invalidate the letters-patent, although the use may be discontinued at the time when the letters-patent were granted. Now, my lords, I apprehend that that is the law, and the known law, upon the subject in this country. I never heard it before questioned, that the notorious public use of the invention, before the granting of letters-patent,

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though it may have been discontinued, is sufficient to invalidate the letters-patent. Then, my lords, the remaining question for consideration is this, and it is an important one: whether, if the learned judge laid down the law incorrectly to the jury, this was calculated to mislead the jury? (His lordship then explained how it was calculated to mislead, and said,)—Therefore, it is perfectly obvious, that, if the learned judge be incorrect in the manner in which he stated the law, in the particular in which I have stated, it was calculated to mislead the jury. Under these circumstances, my lords, I should recommend your lordships to allow the eleventh exception, and to disallow all the rest.

Lord Brougham.—My lords, I entirely agree in the view taken, and for the reason so luminously expressed by my noble and learned friend on the woolsack, that the exceptions, all but the eleventh, were properly disallowed by the court before whom the bill was brought, and that your lordships should disallow these exceptions here, affirming the judgment below; but I also entirely concur with my noble and learned friend, that we have no choice here but to allow the eleventh exception. If we are of opinion, firstly, that the law has been mistaken, and under a misapprehension, it has been erroneously delivered by the judge to the jury; and if we are of opinion, secondly, that the misdirection in point of law, the mistake in point of law, committed by the learned judge, had a direct tendency, I may almost say an inevitable tendency, to mislead the jury in the conclusion to which they should come, and in the verdict which they should deliver,—then, my lords, both of these questions being answered in the affirmative, that the law was mistaken, and that the mistake tended to mislead the jury in their verdict,—we have no choice, but must allow the exception. Now, my lords, a more important mistake in point of law, your lordships will give me leave to say, could not possibly have been made by the learned judge, than that into which the learned judge fell upon the present occasion. And I will not allow it to be said for one moment, in dealing with this question, that there is anything doubtful, that there is anything speculative, that there is any new law to be laid down, or even any new topics in respect of the law about to be broached here, in dealing with the direction of the learned judge; for I speak with all possible respect for that learned judge's great ability and experience in his profession in Scotland, when I say, that this law, which has been mistaken here by his lordship, is a matter of as perfect certainty, as thoroughly known, and as little drawn into doubt, in Westminster Hall, where the law is administered touching the construction of the statute of James, the Patent Act, as any one branch of the law most commonly known, and most frequently administered by our courts. It is one of the greatest errors that can be committed, in point of law, to say that (with respect to such an invention as that,) it signifies one rush whether it was completely abandoned, or whether it was continued

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to be used down to the very date of the test of the patent, provided it was invented and publicly used at the time, twenty, or thirty, or, as in this case, forty years ago, it is perfectly immaterial. There being, in my apprehension, no kind of doubt that the jury would say—"Why should we consider whether it was used at the Bradley Works or not? Why should we consider whether it was a trial or a completed invention? Be it so, that it was used forty years ago—be it so, that it was a complete invention; we hear the learned Lord Justice Clerk telling us that we need not trouble ourselves upon these facts, for it is enough for us if it was abandoned, and that takes the facts out of the case, and leads us to find a verdict the other way." Upon these grounds, my lords, we have no choice in this application, it being a bill of exceptions; we have no hesitation in saying that the law was misconceived, and mis-stated to the jury. The law is undeniable; it is a matter of no doubt or hesitation with any man in this country who has been accustomed to administer it, or, I will venture to say, with any practitioner whose opinion is entitled to any weight; and I am also of opinion, that the law, so laid down, tended to mislead, and must necessarily have tended to mislead the jury. Upon these grounds, I have no hesitation in supporting the proposition of my noble and learned friend, that the eleventh exception must be allowed.

Lord Campbell, after making some observations on the other exceptions, said, in regard to the eleventh, the only question that remains is this: whether this misdirection shall be considered as immaterial? But, when I look at the form of the issue, I cannot say that it was immaterial, because the issue is, "whether the invention, as described in the said letters-patent and specification, is the original invention of the pursuer." Now you cannot say that it was the original invention of the pursuer, within the meaning of the issue, if it had been publicly known and practised by others before the patent was granted. It has been said that there was no evidence; but I think that is a mistake—what conclusion the jury have come to I know not—but at the Bradley Iron Works there was such a machine, as Mr. Rutherfurd acknowledged at the bar, as would have amounted to an infraction of the patent, if the use of it had been subsequent to the patent. Then, that being so, I know not what conclusion the jury may have arrived at. They might have thought that this was a perfect machine, that it was the same machine, and that it had been publicly used. If they had been of that opinion, although it had been abandoned, they ought to have found a verdict for the defender. Under these circumstances, I regret, exceedingly, that I am obliged to concur in the opinion that has been expressed by my noble and learned friend, that this eleventh exception must be allowed, and the consequence of that will be, that there must be a *venire facias de novo*, and that the case must be tried by another jury.

The Lord Chancellor, in delivering judgment, said: "If this

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were a motion for a new trial, I should feel strongly of opinion, that we ought not to have disturbed the verdict; for I think it is supported by the evidence. But when we come to consider a bill of exceptions, we are bound to take a different view of the subject; and if we are of opinion that the jury have been misled, we have no discretion to exercise. We are bound to say, under such circumstances, that the exception must be allowed."

The case, therefore, returns to Scotland for a new trial, upon this ground.

VICE CHANCELLOR'S COURT.

Before Sir L. Shadwell.—March 23rd, 1843.

HANCOCK *v.* DAVIES.

MR. ROTCH, MR. BETHELL, and MR. MILNER, were for the plaintiff,—and MR. STEWART and MR. ELDERTON, for the defendant.

This was an application on the part of the defendant, to dissolve an injunction which had been obtained by the plaintiff, for the purpose of preventing the former from making horse-brushes with flexible backs, upon the principle of the plaintiff's invention, secured to him by letters-patent in 1842.*

The defendant had been negociating for the purchase of the patent, but ultimately declined buying it, because, as he alleged, the leather back of the plaintiff's brush would be liable to crack from friction, and would be injuriously affected by a damp atmosphere, or on falling into a bucket of water. In order, therefore, to produce a brush which should not possess these disadvantages, the defendant inserted the bristles into a wooden back, divided into several pieces, with tape placed transversely across the joints, and pieces of catgut fastened into grooves in the back. The defendant's counsel stated, that the essence of the plaintiff's invention was to insert the bristles into a flexible material; while the advantages of the defendant's brush consisted in the pieces being fixed in a solid back; the catgut being used for uniting together what were in fact four or five separate brushes: the tape was not used as a hinge, but merely to guide the person who made the brush, and protect the catgut from being injured by the saw. Not one of the materials described in the plaintiff's specification had been used; nor was the mode of using them the same; and, furthermore, the novelty of the plaintiff's invention was denied by the affidavits of six unprejudiced brush-makers. It was clear, also, that the plaintiff had not sold any of these brushes, with the exception of about £50. worth, sent to the

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* See vol. XXII., of our present series, p. 22.

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Cape of Good Hope; the patent could not, therefore, have been highly profitable, as stated in the affidavits.

The counsel for the plaintiff stated, that he claimed flexibility in the backs of brushes, in whatever way it may be obtained; the principle of the invention being, to have the back so constructed, as to be capable of assuming either a concave or convex shape. The flexibility of defendant's brush was obtained, not by the wood, but by the connecting medium of the several pieces; in the plaintiff's brush, the connecting medium was leather throughout; in the defendant's brush, a combination of catgut and tape. The flexibility involved elasticity, and therefore came within the principle of the patent, and thus became a direct infringement. Some of the plaintiff's brushes were made of leather and wood, the latter so exceedingly thin, as not to interfere with the flexibility of the leather, but being capable of itself of giving elasticity. In the plaintiff's brush, the bristles are inserted at once into an elastic medium; in the defendant's, they are inserted into pieces of wood, having the elastic medium, not in the front, but in the centre of the brush. The locality of the elasticity was a mere accident—the elastic medium of itself formed the essence of the invention. A great variety of elastic media might be used, such as a piece of India-rubber, inserted between two pieces of wood; or several thin layers of wood might be used, fastened together by caoutchouc cloth. The defendant's brush was an infringement, not only in its principle, but also in its *modus operandi;* the defendant's object was to obtain, by a strip of catgut, the same results as were obtained by the continuous sheet of leather. The plaintiff did not bind himself to the material; the five or six pieces of catgut were just the same as so many pieces of leather, both being elastic materials.

The VICE CHANCELLOR thought the present a very singular case. When the defendant's brush was exhibited to him, he thought it a case which justified interference by injunction; but, having heard the case fully argued, he doubted whether it was really an infringement of the plaintiff's patent. He should have stopped the case at an earlier stage, had not the defendant's counsel asked for the dissolution of the injunction, with costs. It seemed to him that a very fair question had arisen, whether or no the defendant's brush was an infringement of plaintiff's? No one could have acted more fairly than Davies had done, because, at his third meeting, he distinctly stated the objection he entertained to plaintiff's brush. Then it appears he thought, that by inserting the bristles into pieces of inflexible materials, joined together by a flexible substance, more or less covering the backs of the separate pieces, when placed in juxta position, he might make a brush free from the objections he had pointed out. Contrasting the description of the plaintiff's invention with the mode in which defendant has made his brush, he could not but think, that if ever there was a question which fairly ought to be sent to

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a jury, it was the one now before him. At present, the impression on his mind was so strongly in favour of the defendant, that he should dissolve the injunction, leaving plaintiff at liberty to bring such action as he might be advised, giving both parties liberty to apply—so that if the action were not brought in reasonable time, defendant might apply to the Court—and reserving the question of costs to abide the result of the trial.

The plaintiff's counsel having requested his honour to direct an account to be kept by the defendant,—the Vice Chancellor said he was very much against keeping an account; if the plaintiff were entitled to an account, he would have it ultimately.

LIVERPOOL ASSIZES.

Before Mr. Justice Cresswell, and a Special Jury.

AUGUST, 1843.

BIRCH *v.* WOOD AND BROTHERS.

THIS was an action tried at the Liverpool August Assizes, 1843, wherein Thomas Birch was plaintiff, and Messrs. Wood and Brothers defendants.

MR. MARTIN, MR. CROMPTON, and MR. WEBSTER, were for the plaintiff,—and MESSRS. KNOWLES and TOWNSEND for the defendants.

The plaintiff's counsel stated, that the action was brought for the recovery of damages for infringement of a patent taken out by the plaintiff in 1837,* for "certain improvements in carding engines, to be used for carding cotton and other fibrous substances."

The defendants pleaded, First, that the letters patent were not under the Great Seal of Great Britain. Second,—not guilty. Third,—that plaintiff had assigned the letters patent by deed to William Sharrocks and John Sharrocks, before the commencement of the present action; and on these three pleas issue was joined.

The plaintiff's counsel stated, that Mr. Birch had taken out his patent in 1837, being at that time in partnership with W. and J. Sharrocks; that the partnership firm had made the machines, with the invention attached, until its dissolution; and it appeared that the monies received for these machines had been entered in the partnership books. In April, 1839, the partnership was dissolved by deed, the patentee retiring from the concern. Upon that deed defendants sought to prove an assignment of the patent; the plaintiff contended the deed had no such operation or effect; on its production, and being read, it

* See vol. XIV., of our present series, p. 299.

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recited the deed by which the partnership was constituted,—that notice having been given by plaintiff of intention to dissolve the partnership, as regarded himself, it had been agreed that he should assign "all his one-third share, part, or interest of, and in the said copartnership, unto the said W. Sharrocks and J. Sharrocks, &c." There was no recital of, or allusion to the patent. The operative part of the deed assigned "all the one-third part share or interest of him the said T. Birch, of, and in, all and singular, the goods, wares, and merchandises, stock in trade, credits and effects, belonging, due, and owing to them, the said W. Sharrocks and J. Sharrocks, and T. Birch, as partners as aforesaid, and all the estate, right, title, interest, &c."

After the dissolution, the plaintiff went to Ireland, and did not make the machines, and the Sharrocks continued to make them for some months afterwards, and then became bankrupts. From that time, to the commencement of the action, the plaintiff had been in extremely impoverished circumstances, but had received from certain parties a remuneration for infringement of the patent, subsequently to the bankruptcy of the Sharrocks; the present defendants however declined to pay him, and the action was brought.

The specification was put in, and admitted to be clear and sufficient; it was drawn by Messrs. Newton and Berry, of the Office for Patents, Chancery Lane, London.

To prove the first issue, the plaintiff produced an exemplification, or certified copy, under seal of the letters patent, instead of the letters patent themselves; and upon this, Mr. Knowles, for defendants, submitted, that as the declaration made profert of the patent, such an exemplification was not sufficient.

MR. JUSTICE CRESSWELL read the plea.—"The defendants say—that the supposed letters patent, in the declaration mentioned, whereof profert is made, were not, nor are, letters patent under the Great Seal. You admit that is the profert; you admit they are in Court."

MR. KNOWLES.—"We admit profert is made."

MR. JUSTICE CRESSWELL.—"If you admit they are in Court, then the question is, whether the letters patent are under the Great Seal; then he gives evidence that certain letters patent are under the Great Seal."

MR. KNOWLES.—"I do not want to take up more time; I only want to have it on your Lordship's notes."

MR. JUSTICE CRESSWELL.—"Yes; I see your point. Mr. Knowles says that the letters patent are not proved, and that the petitioner is bound to shew that those brought into Court were under the Great Seal."

MR. KNOWLES.—"He is bound to produce the letters patent; that he can only prove his issue by bringing the letters patent into Court. I understand your Lordship to rule that the evidence is sufficient."

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Mr. Justice Cresswell.—"Yes."—The Judge placed the objection on his notes. The infringement was proved beyond all question, the defendants' counsel hardly combatting that part of the case.

To prove the third plea, viz., an assignment of the patent, the defendants put in a plea of dissolution, before referred to, and gave evidence that the expense of obtaining the patent was paid out of the partnership funds; that the partnership manufactured the invention; that the models were left with the Sharrocks, when the dissolution took place; that they (the Sharrocks) worked the patent after the dissolution; that the letters patent were in the custody of the solicitor under the fiat against them; that the patentee had made some application to the solicitor under the fiat, and made some negociation for their being restored to him, and some other matters.

On the defendants' counsel arguing that these circumstances were sufficient to defeat plaintiff, Mr. Justice Cresswell remarked,—"I want to know how it [the patent] became partnership property,—was it assigned by parol?"

Mr. Knowles.—"It became partnership property by the circumstance of its being entirely taken out, and also the expense being borne by the partnership funds, and also by these clauses in the first part of the deed; at least, I should say, that this clause which I read, in the partnership deed, shews the intention of the parties."

Mr. Justice Cresswell.—"It might have been so, and there might have been a clause against his taking out a patent in his own name; but if he did get a patent in his own name, that is another thing."

The Judge decided to receive evidence of the facts, informing defendants' counsel he should remain of the same opinion when proved.

His Lordship summed up in the following terms:—"Gentlemen of the Jury. As to the value of the improvements we have no evidence,—we do not know whether the patent principle is worth more than the old one; but there is evidence of a patent taken out by the petitioner, and there is no evidence in my mind which removes that patent right from him; and therefore he is entitled to recover upon it now. That patent right has been invaded,—the extent of the damages has not been proved,—they have not proved the comparative value of the patented engine with the old one; therefore he has not shewn what profit they have made by that engine: it is for you to give such verdict as you may think right, bearing in mind that I think, in point of law, the petitioner is entitled to something. The usual thing is nominal damages, where there is no evidence of damage."

The Jury found for the petitioner, and Mr. Knowles applied for leave to enter a nonsuit, which was granted, but the defendants did not obtain any rule.

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LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

Oct. 26. *Joseph Alfred Clark*, of Temple-lane, Whitefriars, for an improved pile shoe.
27. *John Biggs & Sons*, of Leicester, for a seamless shirt.
27. *William Beetson*, of 17, Buck-lane, St. Luke's, for a cock, or tap.
27. *Charles Rein*, of 340, Strand, for a trousers-strap fastening.
30. *Miller & Sons*, of Piccadilly, for a rectilineal reflector.
31. *Charles* and *Henry Christopher Windle*, of Walsall, for an instrument for writing, marking, or drawing.
31. *Alexander Bollenot*, of Adam-street East, for a mechanical poultry-feeder.

Nov. 1. *Walter Upton*, of 33, George-street, Hanover-square, for a lamp chimney-glass regulator.
1. *George Forrester & Co.*, of Vauxhall Foundry, Liverpool, for a slide-valve for high pressure and condensing engines.
2. *James Heeley & Sons*, of Birmingham, for an improved pen.
2. *James Dixon & Sons*, of Cornish-place, Sheffield, for a percolator for filtering coffee.
4. *Charles Rowley*, of Birmingham, for a safety canvas button.
6. *Charles Scott*, of Great Hampton-street, Birmingham, for button-shanks, or studs.
9. *William Elliot*, of Regent-street, Birmingham, for an improved button.
9. *Ann Myers* and *Benjamin Burnell*, of York, for a carriage-step.
10. *John Obadiah Newall Rutter*, of Black Rock, Brighton, for a gas-light and lamp ventilator.
13. *James Young*, of Newton-le-Willows, Lancashire, for an apparatus for the manufacture of prussiates of potash and soda.
15. *George Tabernacle*, of 54, Walnut Tree Walk, Lambeth, for a coffee-pot.
16. *John Sheldon*, of 38 and 39, Lancaster-street, Birmingham, for a pocket escritoire.

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Nov. 16. *James Pearse*, of Andover, Hampshire, for a back-band and tugs of harness.

17. *Henry Madden*, of York Chambers, George-street, Adelphi, for a knife-cleaner, polisher, and preserver.

17. *William Rivett & Sons*, of 50, Crown-street, Finsbury, London, for a double washing-stand.

21. *John Thompson*, of 64 and 65, Penny Fields, Poplar, for a machine or apparatus for making or drawing out parts of garments.

23. *Victor Jay*, of 11, Southwark-square, for an instrument for measuring persons' heads, and taking the configuration thereof.

24. *Walker & White*, of 3, Jewry-street, Aldgate, for a coffee and malt-roaster.

27. *Alexander Milner*, of 50, Garden-street, Sheffield, for a ventilating drawer for perforated ventilating hearth-plates.

28. *James Dixon & Sons*, of Cornish-place, Sheffield, for a tea extractor.

28. *Thomas Walker*, of Wednesbury, for a bar-iron for bolt-nuts.

28. *George Tattersall*, of 52, Davies-street, Berkeley-square, for a design for tightening saddle-girths.

28. *Laidlaw & Sons*, of Edinburgh, for an improved gas-meter.

Notwithstanding there appear, in the above list, several mechanical constructions or machines, we beg the public to particularly observe, that the Act, under which they have been registered, affords no protection whatever to such inventions.—[Ed.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th October, 1843, to the 17th of November, 1843, inclusive.

To James Overend, of Liverpool, in the county of Lancaster, Gent., for an invention of improvements in printing fabrics with metallic matters, and in finishing silks and other fabrics. —Sealed 25th October.

John Wood, of Parkfield, Birkenhead, in the county of Chester, in England, merchant, for certain improvements in machinery or apparatus for affording additional or artificial buoyancy to sea-going and other vessels, or for lessening their draught of

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water; and which said improvements are also applicable to raising vessels or other heavy bodies and for securing and supporting the same.—Sealed 25th October.

Ernst Lentz, of Eastcheap, in the city of London, Gent., for an invention of improvements in machinery for raising and forcing water and other fluids; which machinery, when worked by steam or water, may be employed for driving machinery.—Sealed 25th October.

Stephen Bencraft, of Barnstable, Esq., for improvements in the construction of saddle-trees.—Sealed 31st October.

William Needham, of Birmingham, in the county of Warwick, Gent., for improvements in fire-arms.—Sealed 31st October.

Alfred Jeffery, of Lloyd-street, Pentonville, in the county of Middlesex, Gent., for a new method of preparing masts, spars, and other wood, for ship-building and other purposes; and also a new method of defending the sheathing of ships, and protecting their sides and bottoms.—Sealed 7th November.

Charlton James Wollaston, of Welling, in the county of Kent, Gent., for an invention of improvements in machinery for cutting marble and stone.—Sealed 7th November.

Frederick Steiner, of Heyndburn Cottage, near Accrington, in the county of Lancaster, Turkey-red dyer, for an improved manufacture of a certain coloring matter, commonly called "garancine."—Sealed 7th November.

List of Patents

Granted for SCOTLAND, subsequent to October 22nd, 1843.

To John Ainslie, farmer, of Redheugh, near Dalkeith, for a new or improved mode of drying tiles, bricks, retorts, and such like work, made from clay and other plastic substances.—Sealed 23rd October.

Moses Poole, of Lincoln's Inn, London, Gent., for improvements in the manufacture of ornamental lace or net,—being a foreign communication.—Sealed 25th October.

Thomas Young, of Queen-street, London, merchant, for improvements in obtaining power.—Sealed 25th October.

Alexander Angus Croll, Superintendent of the Gas Works, Bricklane, London, and William Richards, of the same works, mechanical inspector, for improvements in the manufacture of

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gas, for the purpose of illumination; and in apparatus used when transmitting and measuring gas.—Sealed 27th October.

James Napier, of Hoxton, in the county of Middlesex, dyer, for improvements in preparing or treating fabrics made of fibrous material, for covering roofs and the bottoms of ships and vessels and other surfaces, and for other purposes.—Sealed 30th October.

Arthur Dunn, of Rotherhithe, soap-boiler, for improvements in treating, purifying, and bleaching oils and fatty matters, and in making soap.—Sealed 1st November.

Robert Rainsford Jackson, of Blackburn, cotton-spinner, for certain improvements in the machinery or apparatus to be used in the preparation of cotton and other fibrous substances for spinning.—Sealed 7th November.

James Johnston, of Wellow Park, Greenock, for improvements in the construction of steam-boilers.—Sealed 14th November.

William Brockedon, of Devonshire-street, Queen-square, London, for improvements in the manufacture of wadding for fire-arms.—Sealed 14th November.

Sarah Beadon, of Hope Circus, Taunton, for improvements in apparatus for regulating the inclination of vessels, for the purpose of drawing off liquids contained therein, in the construction of casks and such like vessels, and in the means of drawing off liquids; part of which improvements are applicable for regulating the inclination of looking-glasses and other articles.—Sealed 15th November.

New Patents
SEALED IN ENGLAND.
1843.

To Jonathan Bell, Senr., of Abbey-street, Bethnal-green-road, Middlesex, trimming manufacturer, and Thomas Ross, of Seebright-street, Bethnal-green-road, aforesaid, trimming manufacturer, for certain improvements in machinery for manufacturing elastic braid. Sealed 27th October—6 months for inrolment.

Alonzo Grandison Hull, of Clifford-street, Bond-street, Doctor of Medicine, for improvements in manufacturing or improving fermented and distilled liquors. Sealed 27th October—6 months for inrolment.

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John Kibble, of Glasgow, Gent., for improvements in apparatus for propelling vessels. Sealed 2nd November—6 months for inrolment.

Matthew Leach, of Manchester, mechanic, for certain improvements in rotary steam-engines, which improvements are applicable to pumps for lifting and forcing water. Sealed 2nd November—6 months for inrolment.

Joseph Dickinson Stagg, of Middleton, in Teesdale, Durham, manager of smelting works, for a new and improved plan for collecting, condensing, and purifying the fumes of lead, copper, and other ores and metals; also the particles of such ores and metals arising or produced from the roasting, smelting, or manufacturing thereof; and also the noxious smoke, gases, salts, and acids, soluble and absorbable in water, generated in treating and working such ores and metals. Sealed 2nd November—6 months for inrolment.

David Evans, of Coleshill-street, Eaton-square, engineer, for certain improvements in sweeping and cleansing chimnies and flues, and in increasing the draft therein, and in preventing the same from smoking. Sealed 2nd November—2 months for inrolment.

Joshua Procter Westhead, of Manchester, manufacturer, for a new or improved fabric, or new and improved fabrics, and also certain modifications of machinery for making the same, which modifications of machinery are applicable to the manufacture of woven fabrics. Sealed 2nd November—6 months for inrolment.

Frederick Isaac Welch, of Birmingham, manufacturer, for a certain improvement or certain improvements in the manufacture of leather. Sealed 2nd November—6 months for inrolment.

Robert Davison, of Brick-lane, Spitalfields, civil engineer, and William Symington, of East Smithfield, civil engineer, for a method of cleansing, purifying, and sweetening casks, vats, and other vessels. Sealed 2nd November—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improvements in furnaces or fire-places, —being a communication. Sealed 4th November—6 months for inrolment.

Robert Raynsford Jackson, of Blackburn, cotton spinner, for certain improvements in the machinery or apparatus to be used in the preparation of cotton and other fibrous substances, for spinning. Sealed 4th November—6 months for inrolment.

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Pierre Armand Lecomte de Fontainemoreau, of Skinner's-place, Size-lane, London, for an improved crane, called 'dynamometric' —being a communication. Sealed 4th November—6 months for inrolment.

William Rowan, of the Firm of Rowan and Sons, of Doagh Foundry, Antrim, engineers, for certain improvements in axles. Sealed 7th November—6 months for inrolment.

Benjamin Parsons, of York-road, Lambeth, engineer, and Edward Esdaile, of the City Saw Mills, City-road, machine sawyer, for an improved machine for cutting leaves of wood, such as those commonly called scaleboard. Sealed 9th November—6 months for inrolment.

Charles Drury Hazen, of Nottingham, merchant, for improvements in machinery for knitting stockings and other articles,—being a communication. Sealed 9th November—6 months for inrolment.

Arthur Dunn, of Rotherhithe, Surrey, soap boiler, for improvements in the manufacture of soap. Sealed 9th November—6 months for inrolment.

William Bush, of Union-street, Deptford, engineer, for improvements in rendering magnetic needles less prejudicially influenced by local attraction. Sealed 9th November—6 months for inrolment.

Thomas Clarendon, of Great Brunswick-street, Dublin, Gent., for an improved method of shoeing horses,—being a communication. Sealed 9th November—2 months for inrolment.

Walter Hancock, of Stratford, engineer, for improvements in the manufacture of caoutchouc, and caoutchouc in combination with other substances, and in machinery or apparatus for preparing caoutchouc and other materials. Sealed 9th November—6 months for inrolment.

Samuel Archer, of Rochdale, Lancashire, flannel manufacturer, for improvements in the manufacture of flannel. Sealed 9th November—6 months for inrolment.

George Holmes, of Stroudwater, Gloucestershire, engineer, for certain improvements in furnaces or fire-places. Sealed 9th November—6 months for inrolment.

Samuel Heseltine, Junr., of Bromley, engineer, for improvements in engines to be worked by air or other gases. Sealed 9th November—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in machinery for

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preparing and combing wool, hair, and other fibrous substances, —being a communication. Sealed 16th November—6 months for inrolment.

John Withers, of Smethwick, Staffordshire, manufacturing manager, for an improvement or improvements in the manufacture of glass. Sealed 16th November—6 months for inrolment.

Luke Smith, of Manchester, mechanic, for certain improvements in, or applicable to, looms for weaving various kinds of fabrics. Sealed 16th November—6 months for inrolment.

Edward Buxton, of Basinghall-street, merchant, for improvements in spinning wool, cotton, and other fibrous materials,—being a communication. Sealed 16th November—6 months for inrolment.

George Scott, of New City Chambers, Bishopsgate-street, Gent., for improvements in the manufacture, purification, and combustion of gas or gases. Sealed 16th November—6 months for inrolment.

James Smyth, of Peasenhall, Suffolk, machine maker, for improvements in the construction of drills for sowing grain, seeds, and manure. Sealed 16th November—6 months for inrolment.

George Gwynne, of Putney, Surrey, Gent., and George Fergusson Wilson, of Belmont, Vauxhall, Gent., for improvements in the manufacture of candles, and in apparatus for, and processes of, treating fatty and other substances, for the making of candles, and other uses. Sealed 16th November—6 months for inrolment.

Ramsay Richard Reinagle, of Howland-street, in the county of Middlesex, civil engineer, for certain improvements in applying atmospheric air as a motive power. Sealed 16th November—6 months for inrolment.

Arthur Wall, of Bisterne-place, Poplar, surgeon, for certain improvements in the manufacture of iron. Sealed 18th November—6 months for inrolment.

James Roose, of Birmingham, Gent., for an improvement or improvements in the mode or method of manufacturing gun barrels and ordnance. Sealed 18th November—6 months for inrolment.

William Shepherd, of Kingston-upon-Hull, joiner and builder, for an improved four-port slide valve, and an improved controller for reversing steam-engines, and for working the steam expansively in the cylinder. Sealed 18th November—6 months for inrolment.

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Edward Elliot, of Tower Royal, engineer, for a means of adding power to the steam-engine and other machinery. Sealed 18th November—6 months for inrolment.

Moses Poole, of Serle-street, Gent., for improvements in the manufacture of parts of knives and other cutting instruments,—being a communication. Sealed 18th November—6 months for inrolment.

Edmund Snell, of Bridge-road, Lambeth, Surrey, Medical Student, for improvements in the manufacture of soap. Sealed 21st November—6 months for inrolment.

Thomas Hancock, of Goswell-mews, Goswell-road, water-proof cloth manufacturer, for an improvement or improvements in the preparation or manufacture of caoutchouc in combination with other substances, which preparation or manufacture is suitable for rendering leather, cloth, and other fabrics, water-proof; and to various other purposes for which caoutchouc is employed. Sealed 21st November—6 months for inrolment.

John Coope Haddan, of Liverpool-street, King's-cross, engineer, for improvements in the mode of manufacturing papier-maché and other articles made of vegetable pulp. Sealed 21st November—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, for improvements in the manufacture of pills. Sealed 21st November—6 months for inrolment.

Octavius Dillingham Mordaunt, of Clifford-street, Bond-street, Gent., for improvements in apparatus for obtaining the profile of various forms or figures. Sealed 21st November—6 months for inrolment.

Moses Poole, of Lincoln's Inn, Gent., for an improved machine for towing or propelling vessels, which can also be used as a boat,—being a communication. Sealed 21st November—6 months for inrolment.

Antoine François Jean Claudet, of High Holborn, glass merchant, for improvements in the process and means of obtaining the representation of objects of nature and art,—being a communication. Sealed 21st November—6 months for inrolment.

Francis Higginson, of Rochester, Lieutenant in the Royal Navy, for certain improvements in fastenings for parts of ships and other vessels; which improvements are also applicable to other building purposes. Sealed 21st November—6 months for inrolment.

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James Connell, of Dublin, Gent., for certain improvements in the manufacture of candles and candle-wicks. Sealed 24th November—6 months for inrolment.

Richard Garrett, of Leiston Works, near Saxmundham, Suffolk, agricultural implement maker, for improvements in machinery for drilling, thrashing, and cutting agricultural produce. Sealed 25th November—6 months for inrolment.

John Frith, of Sheffield, architect, for certain improvements in the manufacture of cannon. Sealed 25th November —6 months for inrolment.

William Irving, of Regent-street, Lambeth, engineer, for improved machinery and apparatus for cutting and carving substances to be applied for inlaying and other purposes. Sealed 25th November—6 months for inrolment.

Edward Tann the Elder, Edward Tann the Younger, and John Tann, all of Minerva-terrace, Hackney-road, iron safe manufacturers, for certain improvements in locks and latches, and in iron rooms, doors, safes, chests, and repositories. Sealed 25th November—6 months for inrolment.

Alexander Vivian, of Gwennap, Cornwall, Gent., for an improved apparatus for dressing ores. Sealed 25th November—6 months for inrolment.

Joseph Rock, Junr., of Birmingham, factor, for certain improvements in locks and latches. Sealed 25th November—6 months for inrolment.

George Edmund Donisthorpe, of Bradford, Yorkshire, top manufacturer, for improvements in combing wool and other fibrous substances. Sealed 25th November—6 months for inrolment.

William John Hay, of Portsmouth, operative chemist, for improvements in producing light, by percussion, for signals and other purposes. Sealed 25th November—6 months for inrolment.

Thomas Drayton, of Brighton, Gent., for improvements in coating glass with silver, for looking glasses and other uses. Sealed 25th November—6 months for inrolment.

John Richard Lund, of Cornhill, chronometer maker, for improvements in the construction of compensation balances of chronometers. Sealed 25th November—6 months for inrolment.

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CELESTIAL PHENOMENA FOR DECEMBER, 1843.

D.	H.	M.	
1			Clock after the sun, 10m. 54s.
	—		☽ rises 1h. 7m. A.
	—		☽ passes mer. 7h. 58m. A.
	—		☽ sets 1h. 57m. M.
	2	15	☽ in Apogee
	4	25	♃'s first satt. will em.
4			Occul 65 Arietis, im. 16h. 27m. em. 17h. 20m.
4	3	33	♃'s second satt. will em.
5			Clock after the sun, 9m. 20s.
	—		☽ rises 2h. 45m. A.
	—		☽ passes mer. 11h. 0m. A.
	—		☽ sets 6h. 21m. M.
6			Partial eclipse of the ☽ Beginning, 9h. 37m. P.M. Middle, 0h. 11m. 7s. A.M. End, 2h. 45m. Magnitude of eclipse, (Moon's diameter = 1.), 0·202. on the southern limb.
7	0	1	Ecliptic oppo. or ○ full moon
	3	9	☿ in Aphelion
	4	10	☿ in sup. conj. with the ☉
	—		Occul Ω_2 Tauri, im. 15h. 34m. em. 16h. 43m.
8	4	25	♄ stationery
	5	57	♃'s first satt. will em.
11	6	40	♃'s second satt. will em.
12	6	37	♃'s fourth satt. will em.
13			Occul g^1 Leonis, im. 10h. 43m. em. 11h. 30m.
14			♂ in conj. with Juno, diff. of dec. 0. 2. N.
	0	53	☽ in □ or last quarter
15			Mercury R. A. 17h. 48m. dec. 25. 9. S.
	—		Venus R. A. 18h. 49m. dec. 24. 11. S.
	—		Mars R. A. 22h. 16m. dec. 11. 51. S.
	—		Vesta R. A. 15h. 59m. dec. 16. 31. S.
	—		Juno R. A. 22h. 15m. dec. 12. 1. S.
	—		Pallas R. A. 14h. 32m. dec. 0. 28. N.
	—		Ceres R. A. 14h. 37m. dec. 7. 51. S.
	—		Jupiter R. A. 21h. 44m. dec. 14. 37. S.
	—		Saturn R. A. 19h. 44m. dec. 21. 28. S.
	—		Georg. R. A. 23h. 55m. dec. 1. 19. S.

D.	H.	M.	
	—		Mercury passes mer. 0h. 14m.
	—		Venus passes mer. 1h. 15m.
	—		Mars passes mer. 4h. 42m.
	—		Jupiter passes mer. 4h. 10m.
	—		Saturn passes mer. 2h. 10m.
	—		Georg. passes mer. 6h. 20m.
	—		Clock after the sun, 4m. 49s.
	—		☽ rises 0h. 40m. M.
	—		☽ passes mer. 6h. 27m. M.
	—		☽ sets 12h. 0m. M.
	7	52	♃'s first satt. will em.
16	16	10	♀ in Aphelion
18	14		☽ in Perigee
19	5	37	♃'s third satt. will em.
20			Clock after the sun, 2m. 21s.
	—		☽ rises 7h. 19m. M.
	—		☽ passes mer. 11h. 14m. M.
	—		☽ sets 3h. 8m. A.
	10	12	♄ in □ with the ☉
			☉ Eclipsed, invisible at Greenwich
21	5	9	Ecliptic conj. or ● new moon
21	7	51	☿ in conj. with the ☽ diff. of dec. 3. 24. S.
	22	48	☉ enters Capricornus,—Winter commences
22	6	32	♀ in conj. with the ☽ diff. of dec. 3. 55. S.
	14	37	♄ in conj. with the ☽ diff. of dec. 3. 6. S.
24	4	16	♃'s first satt. will em.
24	23	41	♃ in conj. with the ☽ diff. of dec. 6, 6. S.
25			Clock before the sun, 0m. 9s.
	—		☽ rises 10h. 20m. M.
	—		☽ passes mer. 3h. 46m. A.
	—		☽ sets 9h. 25m. A.
26	4	12	♂ in conj. with the ☽ diff. of dec. 6. 32. S.
26	4	19	♀ in conj. with ♄ diff. of dec. 1. 18. S.
	6	12	♃'s third satt. will im.
27	13	36	☿ greatest Hel. Lat. S.
			Occul *m* Piscium, im. 7h. 33m. em. 8h. 4m.
	16	38	♄ in conj. with the ☽ diff. of dec. 6. 30. S.
28	2	53	☽ in □ or first quarter
			Occul 45 Piscium, im. 3h. 15m. em. 4h. 26m.
30	8		☽ in Apogee
31	6	12	♃'s first satt. will em.

J. LEWTHWAITE, Rotherhithe.

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THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXLV.

Recent Patents.

To Samuel Kirk, *of Staly Bridge, in the county of Lancaster, cotton-spinner, for certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.*—[Sealed 31st January, 1843.]

These improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning, consist in a novel arrangement and combination of mechanism, for the purpose of compressing the sliver or web of cotton, (as produced by the carding-engine and other preparation machinery,) or other fibrous substance, into cans or suitable receptacles, in order to form the same into coils, containing a much greater quantity or weight of cotton or other fibrous substances than hitherto produced, and, consequently, lessen the number of piecings, producing thereby a more even sliver, and also to lessen the amount of labour usually employed in the preparation processes.

The practical spinner will, doubtless, be aware that the sliver or web of cotton has, in some manufactories, been hitherto slightly pressed into the common small cans, and on or into other receptacles now ordinarily used to receive the

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web as it is produced by the carding-engine, either occasionally by the hand of the attendant, or by a mechanical contrivance.

The object of the present invention is to effect this operation in a greatly extended degree; to employ cans or other receptacles of increased diameter or size; and to compress the web or sliver into a firm and compact body, or to form a continuous coil, as hard as the fibres will allow, and, consequently, effect a great economy in the number of cans or other receptacles, as also in the bobbins, commonly used; as these said coils of slivers or webs may be doubled in any degree or number, and similarly pressed, in connection with the drawing, slubbing, and roving machines, and so afterwards be taken direct to the spinning-frames, entirely without the use of bobbins, if so preferred.

The drawings, in Plate XVI., represent the improved combination of mechanism, as applied to an ordinary carding-engine for carding cotton; and as the further application to the various operations, during the preparation process, will be evident to the practical spinner, a description of them, with reference to the drawing, slubbing, and roving machines, is considered unnecessary.

Fig. 1, represents, in side elevation, the improved pressing apparatus, as attached to the delivering or doffing end of the carding-engine; fig. 2, is a front or end elevation, shewn partly in section; and fig. 3, a longitudinal section, taken vertically through the same. The frame of the carding-engine is represented at *a*, *a*; the main cylinder at *b*, *b*; and the doffing-cylinder at *c*; the web or sliver of cotton is shewn at *d*, *d*, as proceeding through the drawing-rollers *e*, *e*, and being conducted upwards through a pair of delivering-rollers *f*, *f*, from whence it is passed into the can or receptacle *g*, *g*. This can is merely a tube, of about 12 or 14 inches in diameter, and about four feet long, open at both ends, and placed within a slight frame of upright rods *h*, *h*, connected with the bottom or bed-plates *i*, *i*, upon which it stands. The can or receptacle is caused to revolve slowly, as hereafter described, in order to coil the sliver or web therein; and after moving a certain portion of a revolution, it is made to

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ascend, and thus compress the sliver or web which has been collected into the can, between the bottom plate and a presser or block *k*, *k*, which is suspended in the can; and, as it meets the descending sliver, the danger of stretching the sliver, which, in the present plans, frequently happens, is thereby obviated. This presser or block *k*, is formed with an opening *l*, (see plan view, fig. 4,) through which the sliver or web *d*, *d*, passes downwards into the can.

The operation of the improved apparatus is as follows:— Supposing the can to be down, or in the position shewn by dotted lines in figs. 2, and 3, and motion to be communicated to the shaft of the main cylinder, and the sliver or web *d*, passing from the carding-engine between the small delivering-rollers *f*, *f*, and through the slot *l*, in the block *k*, into the can or receptacle *g*, the pinion *m*, on the cylinder-shaft, giving motion to the spur-wheels *n*, *n**, the bevil-wheels *o*, *o*, and diagonal shaft *p*, will, by means of the mitre-wheel *r*, on the cross-shaft *q*, being in gear with the other mitre-wheel *s*, attached to the plate *i**, under the bottom plate *i*, (see fig. 3,) cause the can to revolve slowly, and bring that portion of the sliver *d*, which has just been delivered into the can, immediately beneath the solid part of the block *k*. A crank-pin *t*, is fixed to the spur-wheel *n**, and is connected to the lever *u*; the other end of which lever will, at every revolution of the wheel *n**, strike the pin *v*, on the short lever *w*, and push it into the position shewn in the drawing; and, by means of the segment-wheel *x*, on the shaft *y*, raise the rack *z*, and with it the bottom plates, supporting the can *g*; thus the can will be lifted into the position shewn in the drawing, and the cotton, or other fibrous material, be closely compressed between the bottom plate *i*, and pressing-block *k*. The wheel *n**, still continuing to revolve, will then, by withdrawing the lever *u*, from the pin *v*, allow the can to descend by its own gravity, and the tail *u**, of the lever *u*, sliding along upon the pin *v*, it will thus be out of action, and allow the can again to revolve, by the mitre-wheel *s*, falling into gear with the mitre-wheel *r*; the can will thus again commence revolving, and the operation proceed as before described.

As the cotton, or other fibrous substance, accumulates in

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the can, and raises the block higher, the small ratchet A, fig. 1, falls into the notches in one side of the upright rack B, which supports the block *k*, remaining in the same notch until the accumulation requires another, and prevents the block from falling when the can descends; the small pinion C, which takes into the teeth on the other side of the rack B, being merely for the purpose of raising or lowering the block by hand, when necessary, by turning the hand-wheel D. As the revolution of the can imparts a slight degree of twist to the sliver, and as this is not in all instances desirable, a common reversing motion is represented in the drawing, which may be applied to the apparatus, and by causing the can to revolve alternately, in different directions, (say three times in one direction and three in the reverse,) it keeps the sliver even and untwisted throughout. In order to drive this reversing motion, a train of spur-wheels E, E, E, actuate the worm F, working into a worm-wheel G, on the short shaft H; on the other end of this shaft H, is a catch I, which, acting alternately against one of the pins K, K, on the upper end of the lever L, will cause that lever to oscillate on its centre, and throw the mitre-wheels M, and N, alternately into gear with the wheel O, on the lower end of the diagonal shaft *p*. When the can or receptacle has become filled with the compressed sliver or web, it may be lifted up and entirely withdrawn, leaving the coil of cotton on the bottom plate, and supported by the rods or framing *h*, *h*, which may thus be removed from the machine. Instead of using the rods *h*, *h*, outside the can, an upright spindle, connected to the bottom plate, may be placed inside the can, and the coil of cotton built around it, which will sufficiently support the coil when the outer can or casing is removed. It will be perfectly evident to the practical spinner, that a similar application of the improvement, as above described, in connection with the carding-engine, may also be employed with the other machinery used for preparing cotton, or other fibrous material, for spinning; namely, the drawing, slubbing, and roving machines, in those instances where it is preferred to have the slivers of cotton, &c., made into coils, as first described, instead of being wound on to bobbins, as heretofore commonly practised.

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The patentee claims the peculiar combination, arrangement, and application of the machinery or apparatus above described and exhibited in the drawings, to be used in connection with the ordinary machines for preparing cotton, and other fibrous substances, for spinning, without confining himself to the precise dimensions of apparatus for accomplishing or effecting the object above particularly described and set forth; that is, compressing the sliver or web into cans or other receptacles of a much larger diameter and length than commonly used, commencing the operation on the sliver at the bottom of the can or receptacle, and proceeding upwards progressively, by self-acting means throughout.—[*Inrolled in the Rolls Chapel Office, July*, 1843.]

Specification drawn by Messrs. Newton and Son.

To Alonzo Grandison Hull, *of Clifford-street, in the county of Middlesex, Doctor of Medicine, for his invention of improvements in electrical apparatus for medical purposes, and in the application thereof to the same purposes.* —[Sealed 28th December, 1842.]

These improvements in electrical apparatus, for medical purposes, and in the application thereof to the same purposes, consist in certain modifications of electrical apparatus, by which the size, proportion, and strength of parts of an electrical circuit may be varied, in order to produce certain results from the peculiar manner of applying the electric fluid to the cure of diseases, and the improvement of health.

By way of illustrating the nature of this invention, the patentee states, "that the formation of any mineral, vegetable, or animal body mostly occurs under a particular electrical condition; and the destruction of any such mineral, vegetable, or animal body, occurs under a different electrical condition. Knowing this, I have discovered, that to form or dissolve bodies, either in a positive or negative state of electricity, requires an electrical circuit, the conducting parts of which are possessed of different conducting powers, and the circuit so arranged as to put the part, on which the formation or

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destruction is to take place, in a positive or negative state of electricity, as the case may require. I would also observe, that it requires a certain quantity and intensity of electricity compared with the material or solution from which the body is to be formed, or with the material in which the body is to be dissolved.

"It is easy to explain most of the phenomena of vegetable and animal life, by the laws of electricity; the form of trees; the form, texture, and functions of the organs of animals.

"It is known or believed that the animal functions are in a great measure carried on by electrical forces, and I find that the modifications of electrical forces, artificially applied, may be made conducive to the cure of diseases, and the improvement of health.

"It is by varying the conducting powers of different parts of the electrical circuit that I obtain a certain quantity and intensity or quality of electrical force, acting through the animal body, and so arranging the electrical circuit as to put particular parts of the animal body, forming part of the circuit, in a positive or negative state of electricity, that I produce the beneficial results required."

The following are the methods by which the patentee proposes to carry his invention into effect:—

First.—By making a difference in the size of the positive and negative poles of the circuit.

Second.—By causing water or other fluid, or medicines, or other media, to be the communication with either one or both of the poles and the animal body.

Third.—By making the extent of one surface of the water or other fluid, medicine, or other media, in contact with the animal body, vary from the extent of the surface of water, &c., in contact with the body, and in connection with the other pole.

Fourth.—Varying the quantity or the conducting power of the water or other media in contact with either pole.

Fifth.—Placing the poles in such situations that the part of the body desired to be put in a positive state of electricity shall be nearest to the positive pole, and the part desired to be in a negative state nearest to the negative pole.

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Sixth.—Modifying the action, by placing the poles at greater or less distances from each other when applied.

Seventh.—By dividing either of the terminal conductors, and causing the connection of the circuit to consist of a small quantity of water, or other fluid, in order to modify the action.

In adapting a galvanic battery, or other electrical apparatus, the negative conductor is made of larger dimensions than the positive conductor, or vice versâ, which is the first feature of improvement in this electrical apparatus. Secondly,—the introduction of a vessel of water, or other fluid, through which the electric current is passed, for the purpose of ascertaining and modifying its intensity, when the action of the battery is too strong. Thirdly,—in making medicines a part of the electric circuit between the poles and the animal body, for the purpose of modifying the intensity of the electricity, and introducing the medicine into the body, and also increasing and determining its effects. Fourthly,—in placing the medicine in contact with the animal body, and so applying both poles to the medicine, that the electrieal circuit may pass principally through it, for the purpose of acting upon the surface of the body. Fifthly,—in constructing a tube, having two insulated wires passed through it, for conducting the electricity; which tube is to be introduced into the bladder, for the purpose of dissolving stone. The form of such tube may be like the ordinary catheter, having its end open for the conducting wires to pass through; and the wires may be coated with a non-conducting material, except at their extremities. These wires, being connected to the opposite ends of an electrical battery, will conduct the electric fluid through the wires, and, by its action, cause the stone to be dissolved. Sixthly,—introducing similar insulated conducting wires into elastic tubes, to be inserted into the body of the patient, for the purpose of conducting the electric fluid into or through any part of the body; as for instance, into the stomach, to promote digestion, and other purposes.

The patentee claims, Firstly,—making the opposite poles of the electrical circuit of different sizes, for the purpose of regulating the quantity, intensity, or quality of the electrical force. Secondly,—the introduction of medicine into the

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electric circuit. Thirdly,—insulated conducting wires, for passing the electric current into particular parts of the body. Fourthly,—putting particular parts of the body into a positive or negative state of electricity, in order to stimulate, dissolve, or to form it anew. Fifthly,—varying the extents of the conducting surfaces and quantity of water or other fluid, or kind of fluid, or medicine, for the purpose of modifying the electric current. Sixthly,—introducing medicine into the body, by means of immersion or partial immersion in a bath, acted upon by an electrical apparatus.—[*Inrolled in the Petty Bag Office, June*, 1843.]

Specification drawn by Messrs. Newton and Son.

To WAKEFIELD PIM, *of the borough of Kingston-upon-Hull, in the county of York, engineer, for his invention of certain improvements in the construction or formation of buoys or other water-marks.*—[Sealed 18th March, 1843.]

THESE improvements consist in so making or constructing buoys or water-marks, that they may be rendered more efficient in service, in consequence of greatly increasing the lightness or buoyancy; and also reducing the amount of ballast with which they are usually charged, to enable them to preserve their erect position in the water. Buoys made in the ordinary manner, (when of considerable size,) with closed ends, top and bottom, require several hundreds-weight of ballast to bring them "over end," or cause them to float in an erect position (or nearly so) in the water; which ballast, or weighting, compels the buoy to be immersed fully one-half in the water.

One of the most important objects of a buoy is, that it may be seen as far off as possible, and, consequently, the less it is hidden by immersion, of the greater service it becomes. And another great feature in its construction is lightness; as by weight, the difficulties of mooring and unmooring the buoy are much increased.

In order to effect these important objects, the patentee

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constructs the buoy in the peculiar manner exhibited in Plate XVI., in which fig. 1, is an external elevation of a buoy or water-mark; and fig. 2, a section, taken vertically through the middle of the same.

The invention consists in forming the buoy with its lower end *a*, *a*, open, for a certain space, so that it may be admitted into the water with little or no resistance, and in introducing the bottom, or closing-plate *b*, *b*, at nearly one-third of the length of the buoy upwards, so as to close the chamber or space *c*, and support the necessary ballast. There are apertures *d*, *d*, made just below the bottom plate *b*, for the purpose of allowing the air to escape, that the lower compartment or space *e*, may be entirely filled with water; thus the ordinary ballast or weighting may be reduced to about one-third of that usually employed, as the water itself will sufficiently steady the buoy, and retain it in the desired position. It will be evident, that buoys so constructed will float much higher out of the water, owing to their increased buoyancy, and consequently be seen, by an observer, at a much greater distance than those in ordinary use, and also be kept much steadier, particularly in a rough sea or tide-way.

The patentee claims the construction or formation of buoys or water-marks, having the lower end open for the admission of water for a certain space, and apertures at the upper part of the open compartment, to allow the air to escape, as herein particularly set forth and described, and also shewn in the drawing, whether such buoys or water-marks be made of iron, wood, or other materials.—[*Inrolled in the Petty Bag Office, September*, 1843.]

Specification drawn by Messrs. Newton and Son.

To William Barker, *of Manchester, in the county of Lancaster, millwright, for his invention of certain improvements in the construction of metallic pistons.*—[Sealed 20th March, 1843.]

These improvements in the construction of metallic pistons consist, Firstly,—in the peculiar formation or construction of that part of such pistons called the "packing;" and, Secondly,

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—in the mode of application, and use, of such novel and peculiar construction of packing, for the purpose of rendering metallic pistons perfectly self-adjusting, and also steam, air, or water-tight, either when employed in steam-engines or air-pumps, or in any other situation where a perfectly tight packing is required.

In Plate XVI., fig. 1, is an external representation of a piston of a steam-engine; fig. 2, is a plan or top view of the same, with the cap or top plate removed; fig. 3, a section, taken transversely through the piston; fig. 4, an external view of the metallic packing expanded, or seen as removed from the piston; fig. 5, is an external view; and fig. 6, a sectional view of a similar piston, but slightly modified in its construction. *a*, *a*, is the piston-rod; *b*, *b*, the piston, with its cap or top plate *c*, *c*, and its bottom plate *c**, *c**; between which the improved metallic packing *d*, *d*, is placed, being, in this mode of application, of a somewhat larger diameter than the piston, in order that there may be some degree of elasticity when contracted and placed within the cylinder in which it is intended to work.

It will be observed in the plan and sectional views that there is a clear open space *e*, *e*, *e*, *e*, left entirely around the piston between the body of the piston *b*, *b*, and the metallic packing *d*, *d*, and this space allows for any variation or self-adjustment in the metallic packing, as required, and is essential to the application and use of the improved packing. The manner in which the packing is constructed will be more clearly understood by referring to the diagram, fig. 7, which exhibits the outline of the packing, supposing the same to be extended upon a plane; and this figure is shewn, that any competent mechanic may understand how the packing is to be produced or turned in the lathe. A perfect ring of cast-iron, or other suitable metal, is to be placed in the lathe, and after drilling small holes, as starting and stopping places for the cutting tool, a cut is to be made, which shall be taken in an oblique direction, (produced by the ordinary traverse motion of a slide-lathe,) until half way round the ring, when the cutting-tool must stop cutting at the drilled hole in that situation, and a second cut made in a still more oblique direction, and produced by changing the speed of the traverse

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motion, which will cut or form the line or angle *y*, *z*; the worm or screw is then to be cut parallel, as from *w*, to *x*. When this is effected, the ring is to be reversed in the lathe, and the other oblique cuts are to be made, exactly as before, and the reversed angle produced, as from *u*, to *v*. It will be observed, that the metal to be cut out of the centre part of the ring is three times the width of that removed at the top and bottom, and thus an equal degree of elasticity is left in all parts of the ring of packing. By turning out or removing such portions of metal from the ring, it will be left as the thread of a screw, and, when compressed, it will be found to have attained the desired elasticity. Small pieces are then to be cut from off the extremities *f*, *f*, leaving a space, to allow of the ring being contracted in diameter also. The packing or screwed ring is then to be contracted by clamps, both in its diameter and width, and turned or finished to the intended width of the piston, and the diameter of the cylinder in which it is to be employed: small recesses or channels *g*, *g*, are to be made in the ends of the packing, to be filled up by moveable stop-pieces *i*, *i*, in order to prevent the passage of the steam within the packing. In figs. 5, and 6, a piston is represented, with the improved metallic packing, enclosed by rings of brass *h*, *h*, to be used in those situations where it is preferred.

The patentee claims the peculiar construction and formation of the packing of metallic pistons, and its manner of application and use, so as to be perfectly and equally elastic throughout, and self-adjusting, as herein particularly set forth and exhibited in the drawings, whether such pistons are used in team-engines, air-pumps, or any other situation, where a perfectly steam, air, or water-tight packing is required.—[*Inrolled in the Petty Bag Office, September*, 1843.]

Specification drawn by Messrs. Newton and Son.

To Miles Berry, *of Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improvements in machinery or apparatus for ruling paper,—being a communication.*—[Sealed June 5th, 1841.]

The machine which forms the subject of this invention is

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constructed upon the principle of the ordinary cylinder printing-machine, (now in use for letter-press printing,) and consists of a reciprocating platform, which carries the paper to be ruled; also of two cylinders, covered with cloth; and above which cylinders a carrying roller is placed, which draws the sheet of paper, brought by the reciprocating platform, and conveys it into the machine, where it is passed round the cylinders, and maintained in contact with them, by means of a suitable arrangement of cords, or bands, which, by their peculiar disposition, also turn the sheet of paper after one side has been ruled, and present the contrary side to the pens, or ruling instruments. There is also a wiping, or drying roller, covered with blotting-paper, which revolves in contact with one of the cylinders, and wipes or dries it, and absorbs any ink which may be transferred thereto from the ruled side of the sheet of paper. The axle of the shaft which carries the pens, turns on its centre, whereby the pens are withdrawn from the paper when required.

The pens, or ruling instruments, are supplied with ink, or coloring matter, in the following manner:—When they are withdrawn from the paper, the ink, or color-troughs, are, by suitable mechanism, made to ascend, and dip the nib of the pens into the ink, or color, which rises into the body of the pen by capillary attraction; and this being effected, the ink-trough descends and remains stationary until the pens are again withdrawn from the paper. The ink or color-holders, or troughs, are arranged in such a manner, that different colored lines may be ruled at the same time.

Lastly, there is an arrangement of tapes, or threads, which carry the ruled sheet out of the machine, conduct it to a certain distance, and deposit it in a box placed to receive it. A winch-handle is attached to the upper cylinder, for the purpose of turning it; and by means of a toothed wheel, mounted on the axis thereof, and which gears into a similar toothed wheel on the axis of the lower cylinder, the latter is made to revolve in an opposite direction, and motion is given to the whole machine.

In Plate XVIII., fig. 1, represents a side view of the machine; and fig. 2 is a longitudinal section, taken vertically through the middle of the machine. The frame-work, which

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may be made of wood, is shewn at *a*, *a*, *a*;—*b*, is a platform, for supporting the pile of blank paper to be ruled, and which is fed into the machine in the following manner:—A sheet of paper is placed by the feeding-in boy on the moveable reciprocating platform *c*, *c*, and its situation thereon is regulated by moveable slides. To the under side of this moveable platform a band, cord, or strap *d*, *d*, is attached, as shewn in figs. 1 and 2. One end of this cord passes round a small pulley *e*, and is fastened to the periphery of a roller *f*, upon the axle of which is mounted a pinion *g*, and a traction-weight and cord *h*; the other end of the cord *d*, passes over another pulley *i*, and supports a weight *j*. On the axle of the upper cylinder a small sector-rack *k*, is fastened; and as the said cylinder revolves, the sector-rack *k*, comes into contact with the pinion *g*, on the axle of the roller *f*, and causes it to revolve and draw the moveable platform *c*, *c*, forward, and thereby introduce the edge of the sheet of paper between the roller *l*, and the upper cylinder *m*, *m*. This having been accomplished, and the upper cylinder continuing to rotate, the sector-rack *k*, passes away from the pinion *g*, which is, with the moveable platform *c*, *c*, drawn back by means of the weight *j*, assisted by a slight inclination of the framework *a*, *a*, into its original position. The sheet of paper thus brought into the machine passes partially around the upper cylinder *m*, *m*, and is ruled on one side by one set of pens, or ruling instruments; and from thence it passes on to the other cylinder *n*, *n*, by means of tapes, or bands, in order to be ruled on the other side by a similar set of pens; a roller *o*, covered with blotting-paper, and mounted loosely in bearings, revolves in contact with the cylinder *n*, *n*, for the purpose of drying it, and absorbing any color or ink which may have been received from the ruled side of the sheet of paper. When the ruling is completed on both sides, the sheet is delivered from the cylinder on to the tapes or cords *p*, *p*, by which it is conveyed away.

The pens or ruling instruments *q*, *q*, are fastened to a shaft or bar by screw-clamps, or in any other convenient manner. This shaft turns on its centre, and the time that the pens commence and continue ruling, is regulated as fol-

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lows :—A lever *r*, is fastened on to the axle of the shaft *s*, to which the pens are attached, and the end of this lever bears against a cam *t*, on the axle of the upper cylinder, as seen in fig. 3, which represents a side view of the machine, the toothed wheels on the axles of the cylinder being removed, in order to shew the cams *t*, and the manner of action. When the rise of the cam *t*, comes into contact with the tail of the lever *r*, (as is the case with the upper one), the shaft *s*, on which the pens are fastened, is turned partially round, and the pens are thereby withdrawn from the cylinder, as seen in fig. 2; but when the rise of the cam *t*, has passed round, and the tail of the lever bears against the lower part of the cam, the pens are brought, by the force of the spring *u*, to bear against the surface of the paper on the cylinder, as is the case with the lower cylinder in fig. 2, and thereby rule the paper. The length of the lines is therefore determined by the length of the rise in the cam *t*; and the rise of the said cam is made of several sectional parts, as shewn, in order that lines of different lengths may be ruled as required. These sectional pieces are fastened on to the cam by screw-nuts, and may be easily removed and replaced by longer or shorter ones, as the case may be. The pens or ruling instruments are supplied with ink or color in the following manner :—The ink or color-troughs, or holders, are shewn at *v*, *v*, (fig. 2), and are supported by brackets, connected to a shaft or bar *w*, *w*, which extends across the machine. On the end of this shaft *w*, and outside the framing, is mounted a long lever *x*, (seen in fig. 1), which is acted upon by a cam *y*, in order to bring the lever into the position shewn by dots, and thereby raise the ink-troughs or holders, until the ends of the pens become immersed in the ink or color. This motion is so arranged, that the ink or color-troughs are raised precisely at the time that the pens are withdrawn from the paper.

The above description of the arrangement of the pens or ruling instruments, and the mode of causing them to act upon the paper, also the method of supplying them with ink, applies equally to both sets; and as similar letters of reference are marked upon corresponding parts, no further description of the second or lower set will be necessary. When

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lines of various colors are required, the ink or color-trough *v*, (instead of being made of one continuous length, extending the width of the sheet of paper,) may be composed of several small troughs, and a second set of pens and color-troughs may, if found necessary, be arranged below them.

The patentee does not confine himself to the precise method above shewn, of constructing the machine or apparatus, as it is evident the same may be varied, without departing from the invention; but he claims the arrangement of apparatus for ruling paper, as herein set forth and described, and any modification thereof, when applied to a like purpose.—[*Inrolled in the Rolls Chapel Office, December*, 1842.]

Specification drawn by Messrs. Newton and Son.

To CHARLES CHILTON, *of Gloucester-street, Curtain-road, and* FREDERICK BRAITHWAITE, *of the New-road, engineer, both in the county of Middlesex, for improvements in machinery for cutting or splitting wood for fuel and other purposes.*—[Sealed 16th March, 1843.]

THE improved machine for cutting or splitting wood for fuel and other purposes, is represented in longitudinal section in Plate XVII. *a*, is the main shaft, furnished with a fly-wheel *b*, and driven by a band, from any suitable prime mover; *c*, is a connecting-rod, attached at one end to a crank on the main shaft, and at the other end to a rectangular frame *d*, to which a reciprocating movement is thus communicated. This frame works upon guides *e*, and carries a broad cutter *f*, and a series of narrow cutters *g*; the broad cutter *f*, extends across the front of the frame *d*, and is bolted to the sides thereof; the narrow cutters *g*, are held in a row by their frame *h*, affixed to the frame *d*, and are kept at suitable distances apart, by filling-pieces, the hooked hind ends of which are seen at *i*. The blocks of wood, to be cut or split, are fed to the cutters along the trough *j*, by hand, or by any suitable mechanical contrivance; the frame *d*, then descending, the cutters *g*, divide the ends of the front blocks into a series of

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strips, which are separated from the blocks by the broad cutter *f*, and fall down the shoot *k*.

The patentees do not claim any of the parts separately, nor do they confine themselves to the details shewn, so long as the mode of combining the knives or cutters be retained; but they claim the mode of combining a cutter *f*, with a series of cutters *g*, as herein described, for cutting wood for the purposes of fire-wood, and other uses requiring wood to be similarly cut.—[*Inrolled in the Inrolment Office, September*, 1843.]

To JOHN TAPPAN, *of Fitzroy-square, in the county of Middlesex, Gent., for an invention of certain improvements in apparatus applicable to flues or chimneys, for the purpose of increasing the draft therein, and promoting the combustion of fuel,—being a communication.*—[Sealed 30th May, 1843.]

THIS invention consists of certain mechanical contrivances to be applied to the discharge flues or chimneys of furnaces, for the purpose of increasing the draft thereof, and thereby promoting combustion of fuel; the said improvements being peculiarly adapted to the flues of furnaces or fire-places for burning anthracite coal.

In Plate XVI., fig. 1, represents a vertical section, taken through the centre of the upper part of a chimney-flue, having the improvement applied thereto; fig. 2, is a top view of the same; and fig. 3, exhibits the arrangement of the discharging apertures of the air-chamber, to be hereinafter described.

A, figs. 1, and 2, represents the top or upper portion of the discharge flue or chimney of a steam-boiler or furnace, or that part thereof from which the smoke and gases, or other waste volatile products of combustion, finally escape into the atmosphere. A chamber B, B, constructed of two concentric tubes or cylinders *a*, *b*, (situated at a little distance apart from each other, and jointed together or otherwise connected at their lower ends) is placed, as seen in figs. 1, and 2,—the space between these tubes constituting the chamber.

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The upper portion of the chamber or space between the tubes may be left open, or the same may be covered over by a plate, suitably extending from one tube to the other; through which plate a series of orifices may be formed, for the discharge of air from the air-chamber B, B, into the flue A. Instead of employing the plate with orifices, the upper part of the outer tube may be brought near the inner tube, or so as to contract the chamber or diminish the width thereof at its top, or the part at which the air is expelled. The diameter of the external tube of the air-vessel B, B, is somewhat less than that of the interior of the chimney A; and this air-vessel is supported in its position therein by means of any number of arms *c*, *d*, fig. 2, extending from its external surface to the interior of the chimney, or in any other convenient manner. The air-chamber, so constructed, communicates, by means of a pipe C, with an ordinary fan-blower; the said pipe C, opening into the chamber, and extending therefrom through the side of the chimney, and thence to the blowing-machine.

When a powerful current of air is thrown, by the blast apparatus, through the pipe C, into the chamber B, B, it will rush out at the top of the chamber, and coming into contact with the ascending column of heated air, smoke, or gases, proceeding from the burning fuel of the furnace, will discharge the same from the chimney, thereby creating a powerful draft up the chimney, and through the combustible matter of the furnace.

It has been customary heretofore, in the application of a blast pipe to a furnace, to introduce the same into the ash-pit, or beneath the fire-grate, or under the fuel; but by this improved method of arranging the blast, it acts above the fire.

In order to facilitate the escape of smoke, by means of the blast, thus introduced into the chimney, the patentee inserts, between the inner and outer cylinders or tubes *a*, *b*, a series of curves or helical partitions *e*, *e*, *e*, each of which is placed at a short distance apart from that immediately succeeding it, and extends from one tube to the other, and some distance downwards from the top of the tubes, as seen in fig. 3; the said figure being an elevation of the air-chamber, as removed

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from the chimney, and exhibiting a portion of the tube *b*, as broken away, in order to shew the arrangement of spiral or helical partitions, above mentioned. The spaces *f, f*, formed between the helical partitions, constitute so many openings or curved passages for the discharge of air from the chamber B; which air, rushing out, diverges more or less from a vertical line, and ascends from the chamber with a whirling motion. The centrifugal force, thus generated by the said motion, in the particles of the ascending currents of air, causes them to be thrown or spread out more or less laterally, and thus materially increases the effect of the expelled currents on the smoke and air in the chimney, and as a consequence, greatly improves the draft of the chimney.

Although the chamber B, B, is described as being constructed of concentric tubes, there are various other shapes in which it may be advantageously formed; for instance, the chamber may be a single cylinder, having the spiral or helical discharging orifices in its top, or it may be otherwise conveniently arranged; but the patentee generally prefers the construction of chamber exhibited in fig. 1, as in this case the currents of smoke, proceeding from the furnace, rise through the interior of the inner tube *a*, as well as on the exterior of the outer tube *b*, of the air-vessel; and thus a very great superficial area of discharged air is exposed to contact with the ascending column of smoke; thereby rendering its expulsion from the flue more thorough and effectual, and of course greatly improving the draft.

The patentee claims the method, herein above explained, of creating a draft in flues or furnaces; that is to say, by arranging, in the discharging flue or chimney of the furnace, a chamber or air-receiver B, B, into which air is forced by means of a blowing apparatus, and is discharged therefrom through suitable apertures, formed in its top or other proper part thereof, the whole being constructed and operating substantially in the manner and for the purposes as herein above set forth; and he also claims arranging the discharging apertures of the chamber B, B, in helical or curved directions, for the purpose of creating a rotating or whirling movement of the air expelled from the chamber into the chimney, in order

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to improve the draft thereof, as hereinbefore set forth and described.—[*Inrolled in the Rolls Chapel Office, November*, 1843.]

Specification drawn by Messrs. Newton and Son.

To CORNELIUS WARD, *of Great Titchfield-street, Marylebone, in the county of Middlesex, for improvements on the musical instruments designated drums.*—[Sealed 9th December, 1837.]

THE first part of this invention consists in a mode of straining the heads of drums, for the purpose of tuning them, by turning a button or handle, instead of using the ordinary sliding-straps, "braces," or "tags."

The second part consists in removing a portion from the centre of the skin or drum-head, for the purpose of producing a more even tone, and likewise, obtaining thereby a means of tuning drums.

The third improvement consists in dispensing with the application of cords to all drums having two heads.

The last improvement consists in forming a series of holes in the sides of drums, to permit of the free access of air to the under sides of the heads, in place of the small hole at the bottom of kettle-drums, and the small single hole, termed a sound-hole, in other drums.

In Plate XVII., fig. 1, is an elevation of a drum, and fig. 2, is a plan view of the same, with the head removed, to shew the interior; the cords being thrown off. *a, a,* are the hoops, on which the skins or heads of the drum are stretched; *b,* the wooden cylinder of the drum, on the inner side of which a series of pulleys *c, c,* are mounted; *d, d,* are another series of pulleys, attached to the hoops *e, e,* in place of the holes hitherto made therein; *f,* is a ring or hoop, placed in the interior of the drum, to strengthen those parts exposed to the strain of the cord or cords *g,* used for stretching the drum-heads; *h,* is a right and left-handed screw, passed through a hole in the side of the drum, and carrying two nuts *i, i,* each furnished with a couple of pulleys, around which, and around the pulleys *c, c, d, d,* the cord *g,* is passed, and the ends

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made fast to each other; by turning the screw *h*, the nuts *i*, *i*, are caused to advance or recede from each other, and thus increase or lessen the strain of the drum-heads.

The above improvement is represented, as applied to kettle-drums, at figs. 3, and 4; fig. 3, being an elevation, and fig. 4, a plan view, with the head removed, and the cords thrown off, as at fig. 2.

This mode differs but little from that above described, except in the slight alterations necessary to adapt it to a single head. The pulleys *d*, *d*, are attached to the hoop *e*, by studs or hooks, projecting therefrom, and passing through eyes in the frames of the pulleys; the ends of the cord *g*, instead of being fastened together, are attached to two hooks *i**, *i**.

The patentee sometimes employs a screw *g*, the thread of which is cut wholly in one direction, for the purpose of rendering a greater degree of turning motion necessary to change the tone of the drum from one note to another; in this case one of the nuts turns freely upon a plain part of the screw, and the other travels along it, and performs the tightening of the cords.

Fig. 5, is a section of a kettle-drum, having a hole in the centre of the drum-head to equalize the tone; the edge of the skin around the hole is attached to a ring, by binding twine tightly around it; or it may be secured between two plates, tightly affixed to each other, and having each a hole in the centre. By passing a rod *j*, down through the hole in the skin, and attaching its lower end to the bottom of the kettle-drum, and then applying a nut *k*, to the upper end of the rod, the skin or drum-head may be drawn downwards, as shewn by dotted lines, until the requisite tension is obtained.

Figs. 6, and 7, represent an apparatus for indicating the tune of kettle-drums; fig. 6, shewing the apparatus applied to a kettle-drum, with its front plate removed, and fig. 7, exhibiting a transverse section of the same. To the kettle of the drum a cylindrical box *l*, is fastened, and in it a rod *m*, works, carrying one of the pulleys under which the cord *g*, passes. The rod *m*, has a slot in it, with teeth on one side thereof, gearing into a pinion *n*; and this pinion will consequently be caused to revolve whenever the rod *m*, is moved

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by the tightening of the cord *g*, in tuning the drum. On the axis of the pinion a circular plate is affixed, having the notes of the drum marked on it; and in the cover *o*, of the box *l*, is an opening, and through it the note to which the drum is strained may be seen. The spring *p*, and the screw-key, enable the patentee to regulate the rod *m*, to the note of the drum.

In fig. 8, is shewn a mode of straining drum-heads, by means of rods *q*, and nuts *r*, instead of the cord *g*. Each rod has a hook at one of its ends, and a screw at the other; the hooks embrace one of the hoops of the drum, and the screwed ends of the rods are inserted into the nuts *r*, which are retained securely in the straps *s*, fastened to the other hoop, but are capable of turning freely therein; hence, by turning the nuts, the two hoops will be drawn towards each other, and the drum-heads thereby tightened.

The last improvement consists, as before mentioned, in forming a series of holes in the sides of drums, as seen at *t*, *t*, in figs. 1, and 3.

The patentee claims, Firstly,—the mode of straining the heads of drums, described under the first improvement. Secondly,—the forming of an opening in drum-heads, as herein described. Thirdly,—the application of rods and screw-nuts, as shewn at fig. 8; and Lastly,—the forming of a series of holes in drums, to equalize the atmosphere on either side of the drum-heads, as herein explained.—[*Inrolled in the Inrolment Office, June*, 1838.]

To THOMAS SIMPSON, *of Birmingham, in the county of Warwick, manufacturer, for a certain improvement in buckles.*—[Sealed 2nd March, 1843.]

THIS improvement applies more particularly to harness-buckles; and consists in making the pin, or axis, on which the tongue of the buckle works, moveable, or capable of being easily removed, from the frame of the buckle.

In Plate XVII., fig. 1, represents a front view of the ordi-

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nary harness-buckle, and fig. 2, the tongue thereof, detached. Fig. 3, is a back view, partly in section, of the improved buckle; and fig. 4, is a detached view of the tongue. In the ordinary buckle, the pin or axis *a*, on which the tongue works, is formed in one piece with the frame *b*; and the tongue *c*, is attached thereto, by bending its end into a loop, as seen in fig. 2; but, in the improved buckle, the pin *a*, is made separate from the frame *b*, and passes through holes in the ends of the same, having a screw formed upon its smallest end, to retain it in its place. This pin also passes through a hole in the tongue *c*, which is kept in its proper position by the tubes or collars *d*. To remove the ordinary buckle from the band to which it is attached, the stitching must be ripped up; but the removal of the improved buckle is effected by simply unscrewing the pin *a*.

The patentee claims the construction of buckles in which the pin or axle, for the tongue of the buckle to work upon, and by which the buckle is affixed to articles, is rendered moveable or easy of detachment from the other parts of the buckle, whether such pin or axle be attached to the other parts of the buckle, and detached therefrom by the method hereinbefore described, or by another method.—[*Inrolled in the Inrolment Office, September*, 1843.]

To JOHN MICHELL, *of Calenick, in the county of Cornwall, tin smelter, for improvements in extracting copper, iron, lead, bismuth, and other metals or minerals from tin ore.* —[Sealed 11th April, 1843.]

THIS invention consists in separating from tin ore the small quantities of copper, iron, lead, bismuth, and other metals or minerals, mixed with it; and which, although existing in very small quantities, materially affect the quality of the tin; this is effected by dissolving them in such acids as will not act injuriously upon the oxide of tin.

The tin ore is pulverized, as usual, and the greater portion of the matrix separated by washing; it is then (by preference)

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calcined, and afterwards treated with acid, to dissolve the foreign metals or minerals, which may then be readily washed away. The best time for submitting the ore to the action of acid, is before it becomes cool, after removal from the calcining furnace; and it should be allowed to remain in the acid for three or four days, or for a longer period, if found necessary.

Muriatic acid is preferred by the patentee, diluted with an equal quantity of water, and employed in the proportion of one hundred weight of the ordinary acid of commerce to each ton of ore.

When the foreign metals are in the state of oxides, it will not be absolutely necessary to calcine the ores before operating with acid; and, in some cases, it may be desirable to apply heat, to expedite the process, and lessen the quantity of acid employed, by putting the ore and acid into earthenware vessels, heated by a sand-bath.

The patentee does not confine himself to the use of liquid acid; as the acid evolved in the state of vapour, by various processes, may be employed. He claims the mode of purifying tin ore, by extracting foreign metals or minerals, by dissolving them in acid, and washing them off, or separating them, as above described.—[*Inrolled in the Inrolment Office, October*, 1843.]

To Alfred Francis, *of Vauxhall, in the county of Surrey, Roman cement manufacturer, and* Isaac Funge, *workman, in the employ of the said Alfred Francis, for improvements in the manufacture of ornamental tiles.*—[Sealed 10th June, 1843.]

The first part of this invention relates to the ornamental roofing-tiles, for which a patent was granted to Richard Sheppard, August 17th, 1835;* it consists in making them much lighter, by removing part of the under side of each tile, and thereby forming it into a panel, as exhibited in Plate XVIII.

* For description of this invention see Vol. XIII., p. 100, of our present Series.

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Fig. 1, represents the upper side, and fig. 2, the under or panelled side of the tile; figs. 3, and 4, shew the ends thereof, *a*, and *b*; and fig. 5, is a section, taken transversely through the centre of fig. 2. The grooved edges of these tiles are more round than Sheppard's, and therefore, are not so liable to injury as the sharp angular edges. The upper surfaces and lower ends are reeded, to give them a more ornamental appearance; but the upper surface may be plain, or have other devices impressed thereon; and, if desired, the lower ends, in place of being straight, may be rounded, or made of any other shape.

The second improvement consists in subjecting Sheppard's or other ornamental tiles to certain processes, during the operation of manufacturing them, for the purpose of giving them a different color to that which would result from the ordinary mode of burning in the kiln.

The tiles being made of clay, moulded in the usual manner, are placed in the kiln; when burnt sufficiently, and cooled, they are re-packed, and subjected to a second process of burning in the kiln, muffled in coke, coal, breeze, or other bituminous or vegetable substances; (either with or without a proportion of chalk) and, by the exclusion of air, are changed throughout their substance to a greyish or slatish color. If they are afterwards dipped in a solution of any of the sulphurets, with their bases, a further alteration to green or other colors takes place; and such would also be the case if the tiles were dipped in a sulphuret solution before the second burning; but the color would be more likely to fly off. Manganese, and other metals, as well as different earths, can be used to obtain alterations of color; but the patentees prefer the mode of burning them grey, as being the most economical.

Tiles can be burnt grey, by the process described above, without a second burning; but they would not be so hard, or so likely to retain their color. And further,—Sheppard's, or other ornamental tiles, are capable of absorbing any of the various gases, when admitted to them during the first burning of the clay; the top of the kiln being closed or muffled, and the gas conveyed among the tiles by pipes laid at the bottom of the kiln. Chlorine, or other gases, immediately

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affect the oxides already in the clay, (which the patentees prefer to be mixed with chalk,) and thus green or other colors are produced.—[*Inrolled in the Inrolment Office, December*, 1843.]

To THOMAS MITCHELL, *of Dalton, in the parish of Kirkeaton, in the county of York, dyer, for a certain machine and apparatus for increasing and permanently fastening the face or gloss of all kinds of woollen, worsted, and fancy cloths, by the application of steam alone, without immersing the goods in water.*—[Sealed 15th June, 1843.]

THIS invention relates, in the First place, to a certain machine for winding woollen and worsted cloths or fabrics, requiring heat in the finishing processes, for laying the nap or face, and obtaining a gloss or finish thereto; and Secondly,—to apparatus for applying steam to woollen and worsted cloths when rolled, in order more effectually and readily to set the face, and obtain a gloss thereto.

In Plate XVIII., fig. 1, represents, in cross section, looking towards the left, a machine for rolling cloths of wool or worsted; and fig. 2, is a front view thereof. This machine is so arranged, that the cloth, in its progress to be wound on a roller, suitable for having heat applied thereto, in order to set the face or gloss of the cloth, passes against one or two heated rollers. *a, a,* is the framing of the machine; *b,* is the hollow roller, on to which the cloth is wound; at the two ends of this roller are square holes, and a square bar *c,* is passed through the cylinder, one end of which passes into the square socket *d,* and the other end of the bar has a cylindrical neck, which moves in a bearing at the other side framing. On the socket *d,* that turns in a suitable bearing, is affixed the cog-wheel *e,* which receives motion from the cog-wheel *f,* affixed on the axis *g.* On the axis *g,* is a cog-wheel *h,* driven by the cog-wheel *i,* affixed on the main axis *k,* which is driven by a strap, acting on the pulley *l.* To the main axis *k,* is affixed a cog-wheel *m,* which takes into and drives the cog-wheel *n,* on the axis of the brush-cylinder

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o, by which the nap of the cloth is laid in its progress to the roller *b*. The cloth, in its passage to the roller *b*, is subjected to the action of one or two steam or heated cylinders *p*, *p*, over and against which the guide-rollers *q*, *q*, guide the cloth; and when it is to be heated or smoothed by only one heated cylinder, then, in place of the cloth passing against the lower heating-roller *p*, it is caused to pass over the third guide-roller q^1. In some cases it is required that the cloth should be wound off the roller *b*, on to a similar roller, so as to cause the winding to be more tightly performed; in this case the cloth, on the roller *b*, is, by its square axis, introduced into the socket *r*; the other cylindrical end of the bar being received by the bearing *s*; when another roller, being placed at *b*, the cloth is re-wound, the other end first, and the degree of tightness of the winding is governed by the friction-band *t*, on the cylindrical-collar *v*, affixed on the socket *r*.

The second part of the invention relates to apparatus for applying steam to woollen and worsted fabrics, when rolled. Heretofore it has been common to apply hot water, and in some cases steam, to cloths or fabrics of wool or worsted; but the object of this part of the invention is so to arrange apparatus that steam may be applied, under pressure, to rolls of cloth, enclosed in a suitable vessel, formed to allow of the atmospheric air being driven out therefrom, by the pressure of the steam; the peculiar feature of the invention being the use of steam above the atmospheric pressure, so that the vessel or apparatus may be rendered void of air by steam. Fig. 3, shews a section of the apparatus, which is suitable for applying steam to woollen or other fabrics, whether the fabrics be introduced in the dry or wet state, in place of immersing such cloths in hot water, as heretofore practised. *b*, is a roller, into which steam is admitted; at the upper end of this roller is a plug *e*, which is withdrawn when the steam is first introduced into the interior of the roller; and when the air is driven therefrom, the plug is introduced, the cover *f*, is closed and the screw *i*, is screwed down upon it, so as to close the vessel air and steam-tight. Steam is then allowed to flow into the vessel *j*, and thus drive off the air at

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the cock *k*, which cock is then to be closed; and if the fabric has been introduced, in the wet state, the steam is not allowed to continue to flow into the vessel, after the air has been driven out; but the cock *k*, is closed, and the cock *m*, opened, so that the external part of the apparatus will be kept full of steam, the air being first driven out by the steam at the cock *n*; and in this state, the apparatus is retained for from ten minutes to a quarter of an hour, the nature of the fabrics treated requiring a slight difference of time, which a little practice will enable the workman to judge of. If the roll of fabric has been introduced in a dry state, the supply of steam is to be continued to the inner vessel, during the same time, the outer vessel not being required. The steam, usually employed by the patentee, is of about twenty pounds pressure on the square inch, in the steam-boiler; but he does not confine himself thereto, so long as the steam, passed into the closed apparatus, offers a pressure to drive off the air therefrom, and render it void thereof.

When worsted fabrics are being operated upon, the roller or cylinder *b*, may be used, as shewn; or the same may be perforated all over with numerous small holes,* as is now sometimes practised with worsted fabrics; and which, when separately considered, forms no part of the invention.

The patentee does not confine himself to the precise details, herein described, provided the peculiar character of either part of the invention be retained. But what he claims is, Firstly,—the mode of arranging the parts into a machine for winding cloth on to a roller, as above explained; and Secondly,—the mode of arranging apparatus for applying steam, under pressure, to cloths, and in such a manner, that the air is driven from the apparatus by steam, as above described.—[*Inrolled in the Inrolment Office, August*, 1843.]

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* See Ritchie's specification, Vol. XI., p. 12, Conjoined Series.

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To GEORGE HICKES, *late of Manchester, in the county of Lancaster, but now of Huddersfield, in the county of York, agent, for an improved machine for cleaning or freeing wool and other fibrous materials, of burs and other extraneous substances.*—[Sealed 21st August, 1841.]

THIS improved cleaning machine contains four rotary beaters, which act, in succession, upon the wool or other fibrous material, for the purpose of removing the burs or other extraneous matters that may have become mixed therewith.

In Plate XVII., fig. 1, represents, in vertical section, one of the beaters, with its appendages. *a*, is the beater-shaft, carrying the three blades *b*, *b*, *b*; (the patentee does not, however, confine himself to this number) and *c*, *c*, *c*, are pieces of sheet-iron, or other suitable material, fastened between the blades, to prevent the wool from lapping round them; *d*, *e*, are two pairs of drawing-rollers, which receive the wool from an endless travelling-cloth *f*, and deliver it on to the curved grating *g*; the upper roller of each pair being fluted, and the lower one plain. The lower roller of the second pair *d*, is furnished with a straight-edge or doctor *h*, which is held against it by means of a small weight *i*, hung upon a tail-piece *j*, projecting from the doctor; *k*, is a plate, secured to the curved grating, beneath the lower drawing-roller *d*, and on it the wool is beaten or dressed, as it is delivered by the drawing-rollers.

The action of the machine is as follows:—The wool, having been opened and spread upon the feeding-cloth *f*, is carried by it to the drawing-rollers; in passing through these rollers the wool is slightly drawn, and is then delivered to the action of the beater, by which it is carried along the curved grating to the feeding-cloth of the next beater. The wool is in this manner acted upon by all the beaters successively, and is delivered from the machine in a clean state.

Fig. 2, is a vertical section of a somewhat different arrangement, for delivering the wool from one beater to another. It will be seen, that the carrying-cloth *f*, is in an inclined position, and a moving-grate *l*, is placed immediately over it.

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Against the upright side *l**, of this moving grate, the wool is received when delivered from the beater behind it; the burs, &c., passing through the upright side, and falling into the tray *m*, while the wool is drawn down by the motion of the grate, and carried forward, between it and the feeding-cloth *f*, to the drawing-rollers.

The patentee claims, Firstly,—the general construction and arrangement of the machine for cleaning wool, as regards the beaters being used in combination with a curved rack and drawing-roller, as above described. Secondly,—the particular construction of the beaters, as shewn in the drawings, and the application of a doctor, as at *h*, and used in combination with a curved rack and drawing-rollers. Thirdly,—the plate *k*, on which the wool is dressed, or subjected to the action of the beaters; and Fourthly,—the moving grate *l*, with its rollers and tray, on which the wool is thrown on leaving the beaters, as above described.—[*Inrolled in the Inrolment Office, February*, 1842.]

To Nicolas Henri Jean François Comte de Crouy, *of the Edgeware-road, in the county of Middlesex, for his invention of certain improvements in rotary pumps and rotary steam-engines.*—[Sealed 25th March, 1843.]

This invention consists, principally, in the employment of a revolving piston, of a peculiar form, both in a pump for raising water and also for a rotary engine, to be worked by steam.

In Plate XVII., figs. 1, and 2, represent the improvements as applied to a rotary pump and a rotary steam-engine; fig. 1, being a vertical section, taken through the centre of a pump, and fig. 2, a similar section through a steam-engine. *a*, *a*, fig. 1, is the outer case or cylinder of the pump, the ends of which are closed by cap-plates, in the ordinary way; and *b*, *b*, is the peculiarly formed revolving piston, to the axle of which a moving power must be applied, when employed for raising water or other liquids. The water or other

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liquid enters the cylinder by the pipe *c*, and is discharged therefrom by the pipe *d*, on the opposite side. Between these two pipes is placed a moveable stop *e*, which is always kept in contact with the revolving piston by means of a spiral spring *f*, contained in the box or chamber above. As this box is held in its place, merely by means of screws, as seen in the drawing, it may be easily detached from the pump, without interfering with any other part of the apparatus, should it be found necessary from the derangement of the spring, or any other cause, so to do.

In the steam-engine, as seen in fig. 2, the extremities *b*, *c*, and *d*, of the revolving piston, are rather more pointed than in the other figure; and the steam-stops *e*, and *f*, are constructed and worked in a different manner. The quiescent position of the steam-stops is that represented at *e*; but when steam is admitted into the cylinder, by the passages *g*, *i*, one of the said stops is forced back into the situation shewn at *f*, the lower end of the stop being pressed by the steam tightly against the revolving piston. The expansive force of the steam, acting against that portion of the piston which has passed the steam-stop, will cause the piston to revolve in the direction of the arrows, the steam-stop gradually closing into its seat; and when the point *b*, of the piston, has passed the exit aperture *h*, that volume of steam will instantly rush out of the cylinder, either into the atmosphere or into a condenser. The point *c*, of the piston, having passed the steam-stop *f*, laying it quiescent in its recess, thereby closing the aperture *g*; and the point *d*, having passed the steam-stop *e*, the steam will immediately enter the cylinder by the passage *i*, and drive back the lower stop *e*, against the revolving piston, which is now made to pass through the other part of its rotation; and when that volume of steam has fulfilled its office, it escapes, as before, through the exit aperture *j*. The steam-stops, one of which is shewn detached at fig. 3, are mounted upon hinge-joints, which are also furnished with strong convolute springs, for the purpose of keeping the said stops back in their recesses, when not acted upon by the pressure of the steam.

If the engine is required to reverse the direction of its ro-

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tation, it will be necessary to have another set of stops, as well as additional supply and exit passages; and when the revolving piston is working in the contrary direction, the supply of steam must be cut off from the passages *g*, and *i*, and the additional steam-stops made to collapse in the opposite direction to those above described; the springs, on the hinge-joints of the steam-stops *g*, and *i*, will be sufficiently strong to hold the stops back in their recesses.

The patentee claims, First,—the general construction of the pump and engine, as above shewn and described; and Secondly,—the peculiar form of revolving or rotary piston.—[*Inrolled in the Rolls Chapel Office, September*, 1843.]

Specification drawn by Messrs. Newton and Son.

To James Hill, *of Staly Bridge, in the county of Chester, cotton spinner, for a certain apparatus applicable to machinery, used in the preparation of cotton and other fibrous material for the purpose of spinning.*—[Sealed 19th March, 1838.]

The improvements, included in this patent, are two in number; the first consists in compressing the cotton or other fibrous material into a more compact and dense state, in the can or vessel in which it is received from the carding engine, drawing-frame, and similar preparation machines, than is usually done by means of a reciprocating weight.

At fig. 1, in Plate XVII., the mode of applying this improvement to a carding-engine is exhibited. *a*, *a*, are the drawing rollers of the carding-engine, by which the fibrous material is delivered, in the state of sliver, into the can *b*; the fibrous material is occasionally pressed down in the can by hand in the usual mode of operating, as it would otherwise soon become full, on account of the open and elastic nature of the material; and if this pressure be carelessly performed, the sliver is stretched or irregularly elongated, so that it afterwards produces an inferior roving. To remedy this inconvenience, the weight *c*, is employed, which is suspended over the centre of the can *b*, by a cord or chain *d*, from the

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pulley *e*, and upon the same shaft as this pulley, is another pulley *f*, connected by a rod *g*, with the crank *h*; by the rotation of this crank, a perpendicular reciprocating motion is imparted to the weight *c*, which moves at the same speed that the sliver is delivered, so that, during its ascent, the fibrous material passes freely into the can, and accumulates on the surface of that already deposited; the weight descending, presses it down in the can in a dense and compact state, by which means the can is caused to hold a greater quantity than it otherwise would, and all possibility of injuriously stretching the sliver is prevented.

The rotation of the crank *h*, is effected in the following manner:—Upon the shaft *i*, which carries the crank *h*, is a cog-wheel *j*, gearing into a pinion *k*, on the shaft *l*, as represented at fig. 2, which is a plan of the bracket that supports these shafts, as seen from above; the shaft *l*, has a pair of fast and loose pulleys *m*, *m*, around which passes an endless band *n*, from the pulley *o*, on the main shaft *p*. Fig. 3, shews the mode of applying this improvement to the drawing-frame, or rather to two drawing-frames, standing beside each other; the same letters of reference are used to indicate similar parts, and the effect of compressing the sliver in the cans, is the same above described; but the gearing for communicating motion to the weight is different. Fig. 4, is an elevation; and fig. 5, a plan view of the gearing employed. The weights *c*, *c*, are fastened to the ends of the chain or cord *d*, which passes over the guide pulleys *p*, *p*, and around the double-grooved pulley *r*, on the top of the upright shaft *s*; this shaft passes through the hollow column *t*, fastened to the table of the drawing-frame, and has a pinion *u*, at its lower end, gearing into a toothed segment *v*, connected by a rod with the crank *w*. On the fixed centre of this crank is a bevel wheel *x*, taking into a bevel pinion *y*, on the shaft of which is the cog wheel *z*; this wheel takes into a pinion on the axle of the lower delivering roller, which being made to revolve, in the ordinary manner, gives motion through the wheels, pinion, and crank, to the segment rack *v*, and thus to the weights *c*, *c*. It will be seen that this invention may be readily applied to machines, varying slightly from the carding-engine, and drawing-frame,

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care being taken to regulate the speed of the descending weights *c*, *c*, according to the delivery of the roving.

The second improvement consists in an arrangement of apparatus to be applied to the carding-engine, and slubbing and roving-frame, for coiling the rovings of cotton, or other fibrous material, in a compressed state, upon a revolving disc or face-plate. Fig. 6, represents a front view of the apparatus; fig. 7, an end view; and fig. 8, is a plan of the same. *a*, is a conical pulley, driven by a band from the slubbing-frame; on the pulley shaft is a long spur-wheel *b*, which gives motion to a wheel *c*, mounted on the shaft *d*;—*e*, is a friction-wheel, also mounted on the shaft *d*, which gives motion to the face-plate *f*, by friction of contact; and also to the perpendicular shaft *g*, on which it is mounted. Above this plate *f*, is another plate *h*, which receives the rovings from the drawing rollers; *i*, is a trumpet mouth to guide the rovings, as they are wound upon the plate *h*. Upon the lower end of the shaft *g*, is a bevel-wheel taking into another wheel on the same shaft as a worm *k*, (see fig. 6,) and by the rotation of this worm, a small worm-wheel *l*, is caused to revolve, which gives motion to a pinion *m*, on the end of a common axle. This pinion *m*, takes into a mangle rack *p*, (see figs. 7, and 8,) and by its alternate action on the upper and under surface, a horizontal reciprocating motion of the frame *q*, *q*, is produced; the wheels, on which the frame is mounted, are shewn at *r*, *r*. It will now be seen, that if the trumpet-mouth *i*, before mentioned, is properly adjusted for the roving to pass through on to the plate *h*, at the same speed that the roving is delivered from the drawing-rollers, the traverse of the trumpet-mouth, as well as the friction-roller *e*, will depend upon the movements of the frame *q*, *q*, to which they are connected by the upright rod *s*, seen best in fig. 6. The alternate traverse of the frame distributes the rovings uniformly upon the plate *h*, while a weighted plate *m*, guided by upright slots in the frame-work, presses it, as it is formed, into a compact mass, in which state it may be removed, and submitted to any further process, as required.

The patentee claims the application and arrangement of a reciprocating weight, for the purpose of compressing cotton,

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or other fibrous material, into cans or similar receptacles, applicable to preparation machines, used in the spinning of cotton and other fibrous substances; and also coiling the slubbing or roving of cotton or other fibrous substances, on a disc or face-plate, as above described and shewn in the drawings.—[*Inrolled in the Inrolment Office, September,* 1838.]

To William Henry Fox Talbot, *of Lacock Abbey, in the county of Wilts, Esq., for improvements in photography.*—[Sealed 1st June, 1843.]

The first part of these improvements consists in removing the yellowish tint of pictures taken on calotype and other photographic paper, which has been prepared with a solution of nitrate of silver, by plunging the picture into a hot bath, composed of hyposulphite of soda, (or any other soluble hyposulphite,) dissolved in ten times its weight of water, and heated to nearly the boiling point; the picture should remain in the bath about ten minutes, and be then washed in warm water, and dried. By this means, the picture is rendered more permanent and transparent, and its lights become whiter. After undergoing the above operation, the transparency of calotype pictures may be increased, by causing melted wax to penetrate into the pores of the paper. Under this improvement, the patentee claims the employment of hot or boiling solutions of the hyposulphites, in order to give increased whiteness to calotype and other photographic pictures, and at the same time make them more permanent; also the process of waxing a calotype picture; but only in case the said picture has been previously whitened, or rendered more transparent, by plunging it in a hyposulphite solution, or otherwise.

The second improvement consists in placing a warm plate of iron behind the paper-holder, during the process of taking a calotype picture with the camera, to communicate warmth to the prepared paper, and thus render it more sensitive. Claim:—The process of warming the paper during the formation of the picture.

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The third improvement consists in preparing what the patentee terms io-gallic paper, by washing a sheet of iodized paper with a saturated solution of gallic acid in water, and then drying it. This paper will keep good for a considerable time, if placed in a portfolio or press; and when wanted for use, it may be rendered sensitive to light, by means of a solution of nitrate of silver. Claim:—The preparation and use of the io-gallic paper, as above described.

The fourth improvement consists in washing iodized paper with a mixture of twenty-six parts of gallic acid, and one part, or thereabouts, of nitrate of silver, (the solutions being of the strength usually employed in the calotype process); it can then be dried before a gentle fire, without being spoiled. It is not quite so sensitive to light as the ordinary calotype paper, but it can be used in a dry state, whereas the calotype paper must generally be used in a moist state, as there is some difficulty in making it quite dry, without more or less injuring it. Claim:—The employment of iodized paper, excited or rendered sensitive by a liquid, containing only a small portion of nitrate of silver, and subsequently dried, so as to retain its sensitive state.

The fifth part of the invention relates to a method of improving the appearance of photographic pictures. A copy or reversed impression of a photographic picture is taken in the ordinary manner, except that it remains in the light twice the usual time; its shadows are thus rendered too black, and its lights not sufficiently white. It is then washed and plunged into a bath of iodide of potassium (of the strength of five hundred grains to each pint of water) for one or two minutes, which makes the picture brighter, and its lights assume a pale yellow tint. After this it is washed, and immersed in a hot bath of hyposulphite of soda, until the pale yellow tint is removed, and the lights remain quite white. The pictures, thus finished, have a pleasing and peculiar effect of light and shade, which is not easily attainable by other means. Claim:—Producing a change, by means of iodide of potassium, in the relative intensity of the lights and shades of a photographic copy, subsequently to its first formation, and giving permanence, by a fixing process, to the picture so changed.

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The sixth improvement consists in waxing photographic pictures, to render them more transparent, and then placing a sheet of white or colored paper behind them.

The seventh improvement consists in obtaining enlarged copies of Daguerreotype and calotype portraits, and other small photographic pictures, by throwing a magnified image thereof, by means of lenses, on a sheet of calotype paper, thus producing a magnified negative copy, from which positive copies can be obtained, in the usual manner. Claim:—Obtaining enlarged portraits and pictures by a double photographic process, as above described.

The eighth improvement relates to photographic printing. A few pages of letter-press are printed on one side only of a sheet of paper, which is waxed, if thought necessary, and the letters are cut out, and sorted; then, in order to compose a new page, a sheet of white paper is ruled with straight lines, and the words are formed by cementing the separate letters in their proper order along the lines. The page being completed, a negative photographic copy is taken from it, having white letters on a black ground; this is fixed, and the required number of positive copies is then obtained. Another method, is to employ larger letters, painted on rectangular pieces of wood, colored white, and forming pages therewith, by arranging them in rows, on a tablet or board, suitably grooved for that purpose; a copy (of the size desired) is then taken, on sensitive paper, by a camera-obscura. Claim:—The application of photography to printing, by arranging suitable letters or figures, so as to form pages, and making photographic images thereof.

The last part of the invention relates to what the patentee terms photographic publication; that is, producing a number of positive photographic copies of a picture or print, for the purposes of sale. The objects most suitable for such publication are prints, engravings, drawings, letter-press, maps, music, and similar productions. Copying paper is first prepared, by taking good writing paper, without water-mark, and dipping it in a salt-water bath, consisting of three or four ounces of salt to each gallon of water; it is then wiped and dried. After this, it is washed in a solution, formed by

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mixing one hundred grains of nitrate of silver with two ounces of distilled water, then adding a sufficient quantity of ammonia to form a precipitate, and re-dissolving the same, leaving the solution clear. When dry, the paper may be used for obtaining a negative copy of any print or picture, by placing it in contact therewith, in a copying-frame, (consisting, essentially, of a piece of glass, with a board at the back, and tightening screws, as described in the specification of Mr. Talbot's patent of February, 1841,*) and exposing it to the light, until the negative copy is produced. The negative copy is fixed by a hot solution of hyposulphite of soda, as before described, and may also be waxed; the requisite number of positive copies are then obtained from it, and are fixed in the manner above mentioned. Claim:—The system or combination of these several processes into one, whereby a new and useful result or branch of manufacture is produced: namely, the multiplication of very permanent and perfect copies of the positive kind; and which system consists essentially of four parts, viz., Firstly,—the formation of the negative copy; Secondly,—fixing it, so that it shall have the requisite transparency, and be free from irregular opaque specks in the interior of the paper, and also that it may endure, without change, great subsequent exposure to the light; Thirdly,—the formation of the positive from the negative copy; and Lastly,—its permanent fixation.—[*Inrolled in the Inrolment Office, December*, 1843.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

"An Account of the Brick-making at Blechingley Tunnel."

(Continued from page 371, Vol. XXIII.)

In reply to a question from the President, Mr. Cowper explained that the tiles, &c., after being subjected to the pressure,

* See Vol. XIX., p. 189, Conjoined Series.

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were released by the action of a treddle, which raised the bottom of the mould, and thus brought out the object without injuring its edges.

Mr. Hunt exhibited a model of the brick-making machine used by him, and described its construction and action. The principal working parts consisted of two cylinders, each covered by an endless web, and so placed as to form the front and back of a hopper, the two sides being iron plates, placed so that when it was filled with tempered clay from the pug-mill, the lower part of the hopper, and consequently the mass of clay within it, had exactly the dimensions of a brick; beneath the hopper, an endless chain traversed simultaneously with the rotation of the cylinders; the pallet-boards were laid at given intervals upon the chain, and being thus placed under the hopper, and the clay brought down with a slight pressure, a frame, with a wire stretched across it, was projected through the mass of clay, cutting off exactly the required thickness of the brick, which was removed at the same moment by the forward movement of the endless chain; this operation was repeated each time that a pallet-board came under the hopper.

Mr. Hunt stated that the chief object of the machine, which was worked by hand, was to produce good square compact bricks, of uniform quality, using only a slight pressure. He had found that it was very difficult to dry bricks made by machinery, where considerable pressure was employed; because, before the evaporation from the centre of the clay was completed, the surfaces were overdried, and they frequently scaled off. These machines were in operation in several parts of England, producing usually about 1200 bricks per hour, and each machine required two men and three boys to feed it, turn it, and to take off the bricks; the clot-moulders were dispensed with, and all the persons employed were common labourers.

The machine for making tiles is on the same principle. It consists of two iron cylinders, round which, webs or bands of cloth, revolve. By this means the clay is pressed into a slab of uniform thickness, without adhering to the cylinders. It is then carried over a covered wheel, curved on the rim, which gives the tile the necessary form. The tiles are polished and finished by passing through three iron moulds, of a horse-shoe form. They are at the same time moistened from a cistern, placed above them. The tiles are then cut off to such lengths as may be required, and

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carried away by an endless web, and are placed by boys on the drying-shelves.

Flat tiles, or soles, are formed in nearly the same manner, being divided into two portions while passing through the moulds. The quantity of clay used for one draining-tile being the same as for two soles.

In answer to questions from the President, he stated that the density of the bricks could be augmented; but, in that case, the time required for drying them must be increased, and frequently artificial means were resorted to, which rendered them more expensive.

Captain Buller inquired whether any advantage was obtained by the production of bricks of such a density as that exhibited by Mr. Prosser?—whether builders would not consider them objectionable from their great weight, the difficulty of handling and cutting them, and the increased expense of carriage? He had understood that the lightness of the London bricks, which was chiefly owing to the ashes used in their composition, was considered an advantage, and that they were sufficiently strong for all building purposes.

Mr. Parkes was of opinion that the weight of Prosser's compressed bricks would be objectionable for ordinary purposes; and he did not think that the mortar generally used would adhere to such smooth surfaces as they possessed. The Roman bricks were very dense, but they were small in proportion; and they were used with mortar or cement, which had been carefully prepared for a long period before it was used. The Dutch clinkers, which were so very durable, were small in proportion with their density; and the same might be observed of all foreign bricks, some of which were made with great care. For ordinary work, he should prefer a brick of a less dense quality than the compressed ones.

Mr. Newton had recently examined a wall, which had been built with very dense bricks, and had twice fallen. The bricks appear to have absorbed the moisture from the mortar before it could adhere to their surfaces.

He promised to exhibit, on a future occasion, some bricks which were brought from the Pyramids of Egypt. They appeared to be composed of sand mixed with chopped straw, and had not much cohesion. Yet they were strong enough for the construction of such massive buildings as the Pyramids.

Mr. Hunt said that engineers generally preferred dense bricks, as their work required strength. He had found it advantageous

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to use mild clay instead of a stronger quality, as compact bricks made from the former, when well tempered, were better than those of the same density made from the latter.

Mr. Fowler said that the value of bricks depended upon their strength; but he doubted whether density and strength were in this case synonymous; and he thought that bricks of a cellular structure would not only be stronger, but would unite better with the mortar. He thought, however, that Mr. Hunt's machine would prove advantageous, as the bricks produced by it would be of more uniform character than those made by hand moulding.

Mr. Pellatt believed that light bricks were generally porous, and that when they were used for building external walls, the moisture soon penetrated; this was not the case with dense bricks, and if they were generally made more compact, thin walls would resist damp as well as thick ones.

Mr. Cowper believed, that for architectural purposes so much density was not absolutely necessary. Houses three stories high had been constructed by the mode of building called "Pisa" work, which was merely ramming down tempered clay into moulds of the thickness of the walls, and allowing the mass to be dried by the sun as the work proceeded. In countries where the climate was very dry this method succeeded perfectly.

Mr. Bennett said, that the principal varieties of bricks made for the London market, were called "malm paviors," "stocks," "grizzles," "places," and "shuffs;" for the first kind the clay was washed and selected with care: the bricks so produced were of superior quality. The other kinds were all made from the same clay merely tempered, the difference between the sorts being produced entirely in burning them; common stocks were good enough for all ordinary building purposes; but the inferior qualities could not be trusted for important works.

As to the relative prices of the several sorts, the difference between malm paviors and stocks was fifteen or twenty shillings per thousand; between stocks and places ten shillings; the grizzles obtained a price midway between the two last named, and the shuffs were sold for an inferior price, governed by their quality, as they were frequently quite rotten.

Mr. Lowe enquired what object there was in the mixture of breeze or ashes with the clay for making bricks; was it intended to render them less dense, or to assist the combustion, when in the clamp or the kiln?

Mr. Bennett believed, that the principal advantage of using a

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mixture of ashes with the clay was, that it rendered the combustion more regular, when the bricks were burned in open clamps; the sifted breeze was employed for fuel instead of coal, which would otherwise be used for burning in close kilns.

Mr. Hunt explained that the method of making bricks, in the vicinity of London, differed from that of almost all other places, because the material employed was not pure clay; it was a substance nealy resembling loam, of a slightly cohesive nature, which would not admit of its being used in the natural state, and burned in close kilns with coal, but that with an admixture of ashes it became sufficiently tenacious to be formed into bricks; the ashes performing the same office as the chopped straw did in those made by the ancient Egyptians.

Of the sixteen hundred millions of bricks made annually in England and Wales, about one-fifth part only was made according to the London method, with a mixture of ashes.

As to the density, he did not think that the weight of bricks should be received as an index of their quality; for bricks made by exactly the same process, and equally compact, would be heavier or lighter, as they were made of strong or of mild clay, and yet their strength would be equal.

Mr. Pellatt observed that nearly, if not all argillaceous or aluminous earths, were, with certain modifications or admixtures, suited for making bricks. The term silicate of alumine might include the various earths, whether denominated clay, marl, loam, argile, &c. The best fire-bricks were made from native clay, containing alumine combined with a large proportion of silex. The cohesive or plastic property arose from the former, but too much of it rendered the bricks fusible. As most of the common clays contained a large proportion of alumine, with occasionally lime or other fusible substances, a mixture of coarsely pulverised burnt clay, sand or cinders, became necessary, in order to counteract that tendency.

Alumine had a great affinity for silex, as well as iron and sulphuric acid, and the large use of cinders, as a mixture with the London clay, might be accounted for, not only as it reduced the proportion of alumine to other substances, but because it had a tendency, when submitted to heat, to carbonize the sulphates, and to diminish the fusibility of the brick. Bricks made of common clay could not be burnt under the same high temperature as fire-bricks, and they contracted much more in burning.

All dry substances, which were used to decrease the proportion

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of alumine, in making bricks or crucibles, were included by the French under the general term of "ciment."

The most useful properties of "ciment," when well pugged or kneaded with the clay, were to hasten the drying, and to diminish the contraction, and the consequent risk of breaking in the kiln: the addition of "ciment" was economical for fire-bricks, particularly when they were manufactured at a distance from the mines; the fire-clays of Stourbridge, Newcastle, and Glasgow, were found amidst the coal strata; Stourbridge clay was the most esteemed, and when carefully picked, ground, sifted, &c., would bear, for brick-making, two proportions (by weight) of burnt clay or "ciment," to one of native clay. The sagger clay, from the Staffordshire potteries, was also a fire-clay, and was well suited for making tiles or bricks, of a compact character, but was probably more liable to be vitrified than the Stourbride clay. China clay, or the "kaolin" of the Chinese, was decomposed felspar, called in the potteries "Cornwall stone;" the undecomposed felspar was interposed with it, and used by the French and the Chinese as porcelain glaze, the term used for it by the latter was "petuntse." The constituents of "kaolin" were—

According to Dr. Ure.		Murray quoted Vanquelin's Analysis.		Murray stated Vanquelin's Analysis of Hessian Clay to be—	
Silica . . .	52	Silex . . .	74	Silex . . .	69
Alumina . .	47	Alumina . .	16·5	Alumina . .	21·5
Oxide of iron	0·33	Lime . . .	2	Charcoal . .	1
		Water . . .	7	Oxide of iron	8

Mr. Parkes believed, that in addition to the ashes giving a cohesive character to the material of which the bricks were composed, they were of advantage in the process of burning, because they enabled the fire to spread gradually from the lower tiers, through the mass in the kiln, without permitting an intense partial heat, such as sometimes occurred where coal alone was used, the effect of which was, that all the bricks around were vitrified and their surfaces became glazed.

Mr. Dickinson observed, that the ashes used in making stock bricks, could not supply the place of the straw now discovered in the Egyptian bricks, because the process of burning would have destroyed the straw as it appeared to do the ashes; he had burned bricks extensively in clamps and in kilns, and it appeared to him that the ashes assisted in fluxing the brick-earth, for on

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breaking a good stock brick it was always found that the interior appeared to be vitrified, and was extremely hard; and he remarked, that if the ashes worked in with the clay in pugging, either exceeded or fell short of the ascertained proper quantity, the bricks were fragile and less durable.

May 9th, 1843.

The PRESIDENT in the Chair.

No. 619. "Observations on the periodical drainage and replenishment of the subterraneous Reservoir in the chalk bason of London." Continuation of the paper read at the Institution, May 31st, 1842.—By the Rev. J. C. Clutterbuck, M.A.

The author commences by answering an objection founded upon a passage of Connybeare and Phillips' Geology (Book 1, Chap IV. sec. 11), which was argued against his former statements.

The water, it was said, appeared to rise in different places to different heights—at Mile End it stood at the level of high-water mark in the Thames; at Tottenham 60 feet; at Epping 314 feet; and at Hunter's Hall, 2 miles beyond Epping, at 190 feet above that level. Especial stress was laid on the height to which the water was supposed to have risen in the well at Epping, namely, to within 26 feet of the surface, and to 314 feet above high-water mark. It appeared from a note appended to the statement referred to, that the first 27 feet from the surface of this well consisted of gravel, loam, and yellow clay, and that after sinking 200 feet, and boring 220 feet, as no water was found, it was considered a hopeless labour, the boring was discontinued, and the well covered over; that at the end of five months, it was found that the water had risen to within 26 feet of the surface; from which it might be inferred, as was afterwards proved, by information obtained from the owner of the well, that this supply of water was to be attributed to a landspring, and was not derived from the sand of the plastic clay formation, to which the boring had not penetrated.

Having thus answered this objection, it is shewn that a line drawn from the water level at Hunter's Hall to mean tide level in the Thames, 10 feet below high-water mark, would cut the level in the other wells, and give a water level dipping at an average inclination, very nearly coinciding with that insisted on

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in the statement to which the objection was raised. It appeared that the difficulty of determining the exact dip of the water level between the river Colne and London, had in some measure been removed, by the sinking of three wells in the direct line of the author's observations, namely, from the river Colne one mile N.E. of Watford, in a straight line to Edgware, and thence by the high road to London. The information thus obtained, proved the general correctness of the author's former calculation as to the line that would represent the natural water level.

It is then shewn that a line drawn from a point 3 miles south of the Colne, at the level of that river, or 170 feet above Trinity high-water mark, to mean tide level in the Thames below London Bridge, (a dip of about 180 feet in 14 miles, or an average inclination of 13 feet in the mile,) cuts the water level at the point whence it is drawn, at Hendon Union Workhouse, and at Cricklewood, between that place and Kilburn; whence it may be inferred, that up to this point there is no apparent trace of a depression of level caused by the exhaustion of water under London. At Kilburn, the water level (which is known to have stood some years since about 20 feet higher than at present,) is considerably depressed below the line so drawn, which depression may be attributed to the influence of the London pumping;—it is suggested, that it is desirable that the wells on the confines of London, and throughout the district, should be periodically measured, to ascertain to what distance, and in which direction, this yearly increasing depression may be found to extend.

The author proceeds to describe a phenomenon connected with the periodical replenishment of that portion of the London basin which underlies the London and plastic clays, and which cannot, as in the upper or chalk district, be fed by infiltration. This phenomenon is by him called the "oscillations of the water level," caused by the irruption of rain water, which runs from the surface of the London and plastic clays, and which sinks into the subjacent chalk through "swallow-holes," on its arrival at the outcrop of the sand of the plastic clay formation. This point of irruption lies to the southward of the river Colne, and forms the line of demarcation between the clay and chalk portions of the surface of the London basin, leaving a belt of the latter varying from two to three miles, or more, in width, between the river and the outcrop of the clays.

The water level rises to a point within the outcrop (called the fixed summit level,) at an angle of not less than 10 feet in the

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mile, when most depressed by the springs; below an angle fixed on as the lowest line of inclination to which the water in the chalk will fall. From the fixed summit the level declines towards London; in the line taken, it is found at the level of the Colne, 3 miles from the river. After heavy rains, when the clays throw the water from their surface, the irruption of water may be seen at the outcrop of the sand of the plastic clay formation; the level will then be raised in proportion to the quantity of water which passes through the sand into the chalk beneath it, the elevation of level extending towards the river in a ratio increasing with the distance from the river. The fixed summit will remain unaltered, uutil the level at the point of irruption has attained an elevation at which the water can flow towards the south. After a period of protracted drought, the level will decline in the same ratio as it had risen, until it assumes a line in which little or no variation can be traced.

In a given line from the Colne at Watford, to the village of Bushey, one mile and a half distant, in the autumn of 1841, the level was found to rise from the river, at a regular inclination, to a point within the outcrop of the clays. After heavy rains, the level, near the swallow-hole, which receives a large body of water, began to rise rapidly, the fixed summit level not being affected till the level, at the point of irruption, rose above it; the total rise at the point of irruption was 20 feet, and at the fixed summit 2 feet. The position of the summit level had then varied from the fixed summit to the point of irruption; coincidentally with this elevation the level under London rose also, and began to decline at the same time that the level, at the point of irruption, sank below the fixed summit. The subsidence of the level at the point of irruption, was,—in April, 4 feet; May, 3 feet; June, 2 feet; July, 1 foot; August, 9 inches; September, 6 inches; in October, and to November 8th, 1½ inch; the average inclination, from the fixed summit to the river, then being about 15 feet in the mile. The subsidence of the level to this inclination, was coincident with a visible defalcation in the product of the springs discharging themselves into the river Colne. In the autumn of 1842, and in the preceding spring, similar effects were observed, both as to the rising of the level at the point of irruption, and the coincident elevation of the level under London. This oscillation of level has been traced at various points, both to the east and west of that here described.

It is probable that near the junction of the Colne and the Ver,

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the level dips directly from the level of the latter river, at a point where the plastic clay extends itself under the Colne to the margin of the Ver. This suggests the probability of that to which the author alluded in his former communication; namely, the possibility of connecting a periodical defalcation observed in the waters of the Ver or the Colne, at those seasons when the water is short, with the exhaustion of water under London. The evidence in favour of this supposition has been strengthened, during the past year, by a repeated coincidence of variation in the London level with the supply of water in the river. The height of the water in the river (about 210 feet above Trinity high-water mark) gives the same average inclination of level towards London as observed in other places, and strengthens the probability that the supply of water to the river may be affected at this point by the London pumping, the daily increasing demand of which will, if (as is contended) there be any ground for this supposition, very soon put this question beyond a doubt.

Mr. Dickinson said, that Mr. Clutterbuck's observations had been caused by a project for obtaining a supply of water for the metropolis, from wells to be sunk in the valley of the Colne. It had been stated, in support of the plan, that the rapidity with which the rain-water percolated into the bowels of the earth, in a great measure prevented evaporation, and hence it might be assumed, that the quantity which descended upon the surface of the chalk found its way, with very slight diminution, into the fissures below. This reasoning was not in accordance with the deductions Mr. Dickinson had drawn from an extended series of observations, and, fearing that his mill property might be injured by the diminution of the supply of water, he had opposed the project.

He had found it necessary, several years since, to investigate strictly the nature and extent of the supply of water to the springs and rivers of the chalk district, for which purpose he had a common rain gauge, which was corrected by observations upon that kept in the same district by the Grand Junction Canal Company. He also fixed a rain-gauge, on the principle suggested by Mr. Dalton, which demonstrated the quantity or proportion of the rain falling on the surface, which descended so far into the earth as to be beyond the reach of evaporation, and therefore, must be calculated to reach the internal reservoir of the country whence

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the springs were fed. This gauge demonstrated that the greater part of the rain that fell on the surface was either consumed by vegetation or evaporated. It furnished information of the most valuable kind, both as regarded his mills and business, and as to any engineering operations, having reference to the perennial supply of water in the springs and rivers of the district.

Mr. Dickinson presented a statement of the comparative result of his two gauges for the last eight years, pointing out, as was generally the case, that none of the rain-water penetrated to the springs between the 1st of April and the 30th of September. He also stated that the indications of the gauge were not only certain, but that they preceded generally, by about two months, any thing that could be deduced from the observation of wells, with reference to the effect upon the rivers; and that, as to the latter, the only guidance to be derived from the state of the wells was from those in the higher range of the chalk, because, along the valleys where the streams flowed, the level of the wells continued nearly the same throughout the year.

Mr. Clutterbuck perfectly agreed with Mr. Dickinson as to the satisfactory results yielded by Dalton's rain-gauge; but he had, from the first, expressed an opinion, that the same practical results might be obtained by a periodical measurement of the wells, in any part of the chalk district. If a line was taken, extending from the river or vent to a point midway between the rivers Gade and Ver, or any others, and observations made during different periods of the year, and the same periods of different years, the height to which the water rose or fell, would indicate the quantity which had actually percolated to the water-level, and would give the relative quantity to be delivered out by the springs. The ratio of alternation throughout the line would be maintained with such undeviating regularity, that by the measurement of the wells at the two extremes, the rise or fall of all between them might be calculated with the greatest exactness. He had chosen, by way of illustration, a portion of the line, of which a section, three miles in length, was given, extending in a direction north and south between the rivers Gade and Ver, a locality whence a considerable portion of the water, which in part moved the machinery at Mr. Dickinson's mills, was derived. He took the seasons, which govern the supply of water, as shewn by Dalton's gauge. In the season 1840-41, the gauge indicated the percolation of less than 5 inches of rain, a quantity which must be far short of that which found its way to the water-level. The gauge

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recorded no percolation of water immediately after the melting of the snow on the 15th of January, 1841, within a month of which time the level rose in some localities more than 15 feet. To make a proper estimate of the quantity of water to be delivered from the springs, it was necessary to ascertain the state of the level before the percolation commenced. To this the rain-gauge was no guide; but by Mr. Clutterbuck's observations he was enabled to determine the exact relative depression of the level. The first day taken was September 13th, 1841, between which period and November 8th, the level rose at one point 18 feet, and at other points in due proportion, which distinctly proved that "the indications of the rain-gauge do not precede by two months any thing that can be deduced from observations on wells." His next observation was February 14th, 1842, shewing the highest point at which he measured the level, giving a total rise of 34 feet, though from observations elsewhere it must previously have risen even higher, and have fallen to that point in consequence of the accelerated drainage caused by the breaking out of springs at higher levels, when the water in the chalk attained a certain elevation. On the 7th of May the level had fallen considerably, and on the 24th of October had declined to within a few inches of the same level as in the September of the previous year. In the season 1841-42, Dalton's gauge indicated the percolation of 17·98 inches of rain; in 1842-43, 10·64 inches; but from the causes before alluded to, and from the rain not having percolated till a later period, the level continued to rise till May, consequently the quantity of water then in the chalk was greater in proportion than as 10 to 17. He conceived that the great practical question was, what supply might be reckoned upon from the 1st of May to the end of October? The reply to this was, he contended, more distinctly given by his observations than by the indications of Dalton's rain-gauge.

With reference to the rapidity with which the water found its way from the surface to the level, except when there was a great quantity of rain within a very short period, the percolation would be gradual, as indicated by a steady and progressive rise in the wells, which he had ascertained to amount sometimes to 1 or 2 inches in a day in the upper district, and continued generally to the beginning of May. In the neighbourhood of the swallow-holes, the level rose very rapidly. A well sunk 50 feet in the chalk, in which the water stood at 40 feet from the surface, was affected within 15 hours after a late heavy rain commenced. The

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quantity of rain, which amounted to 1 inch in 12 hours, appeared to have retarded by a fortnight the exhaustion of that portion of the level to the south of the Colne, which is fed by the irruption of water through the swallow-holes. On a former occasion, between the 10th and 25th of November, 1842, there fell on the surface 3·88 inches of rain; the level near the swallow-holes rose 6 feet within the same space of time.

When the water had reached the level, the influence of one part on another was very rapid. Thus when the distant level was raised, as Mr. Clutterbuck had described, there was a simultaneous rising of the level under London. The continuity of the level, as shewn in his section, was the best evidence in favour of the supposition, that the water to London was mainly supplied from the source to which he had attributed to it.

He had not met with any evidence in favour of the supposition that a distinction was to be drawn between the water from the chalk and that from the sand. He believed that it was all derived from the chalk, whence it rose into the sand, to which there appeared no impediment. At the points where the water broke through the sand, it invariably sunk into the subjacent chalk, a space being left between the bottom of the sand and the top of the water. Following the water-level it might be traced in the chalk, and rose into the sand, when the surface of the chalk sunk below the inclination at which the water-level dipped towards London; from whence he inferred that the whole level of water might be called the "Chalk-water level."

Mr. Simpson reiterated his opinion respecting the waters in the sand and in the chalk being different. He had seldom found the water from those strata stand at the same level; and in the majority of instances, the water from the chalk rose to higher levels than that from the sand. Towards the west of London, prior to 1830, there were numerous cases of overflows from bore-holes; and he believed, from an account drawn up by him from actual inspection of the wells when they were sunk, or soon afterwards, and which he presented to the Institution, it would be found that in the majority of instances of overflowing wells the water proceeded from the chalk.

This paper gave an account of sixty-seven wells, detailing in several cases the various strata passed through, and in all the total depth; the levels at which the different qualities of water were met with; the quantity of water yielded; and the height to which the main supply rose in the well. He had found from recent in-

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quiries, that in many of these wells the water had now ceased to overflow. It would appear that as the number of wells and bore-holes had increased in some districts, the water-levels had been depressed. In several cases, the cause of this had been traced to wells which had been bored at extremely low levels, and in others to the increased pumping.

Messrs. Worsencroft and Brothwood, of Hammersmith, who practised well-sinking extensively some years since, were most successful in wells where their competitors had ceased working when they had pierced some distance into the sand strata, whence the water only rose to some distance beneath the surface; but by continuing the boring down into the chalk, they obtained over-flowing wells.

Mr. Scanlan said, that the difference between the water from the two strata was easily discovered by analysis. The water from the sand contained common salt and no lime, while that from the chalk contained lime and no common salt.

Mr. Clutterbuck said, in answer to Mr. Simpson's objection as to the identity of the chalk and sand water-levels, the disparity of level that he spoke of, occurred in localities where there was an exhaustion by overflowing Artesian fountains, in which case a discharge of water was created below its natural level, which would cause the same kind of depression either in the sand or the chalk, as that which was caused by pumping the same quantity of water from a corresponding level, where the water would not flow above the surface; the only difference being, that in the former the depression was permanent, and in the latter it was coincident with the temporary exhaustion of the pumps. As the water was discharged from the Artesian fountains more rapidly than it rose through the sand from the chalk, a permanent depression took place in the wells sunk into the sand, whilst a lesser depression occurred in the chalk, and thus caused a disparity of level. Thus the water-level, in the wells sunk into the sand in London, was temporarily depressed by pumping from others in the neighbourhood, and the level was regained when the pumping ceased.

Mr. Braithwaite eulogized the industry and observation of Mr. Clutterbuck; and he hoped that he would extend his investigations to the point of the outcrop of the basin of the river Thames, which he had stated to be near Woolwich, He must, however, dissent from the author's views, as to the supply of water to the sand under the plastic clay being derived from the chalk; and

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also, that if no rain fell during a period of three years, the water in the wells referred to in the section would retain their relative levels, at an inclination of not less than 10 feet in a mile. He believed that any continuation of dry weather which would affect the land-springs, would also diminish the filtration; and the upper part of the basin on all sides would be affected before the greater depths.

Mr. Braithwaite also differed from Mr. Simpson as to the supply for the overflowing wells at Kingston, Mitcham, and other parts being from the chalk. On the contrary, he was of opinion that it proceeded from the sand under the plastic clay; and he instanced Mr. Palmer's well at Kingston, and that sunk by Mr. Clark at the Kingston Union. The latter well was within 100 yards from the former; it was 420 feet deep to the sand-spring, and the water rose to within 7 feet from the surface. While the water stood at this level in the well at the Union, it overflowed at Mr. Palmer's; but when the level at the Union was reduced by pumping to 20 feet from the surface, the water at Mr. Palmer's well ceased to overflow; thus, he contended, establishing the fact that the water in both wells was derived from the sand, and not from the chalk.

Mr. Clutterbuck observed, that the reason why there was a depression observable at Kilburn and not at Cricklewood, was easily explained, if the depression caused by the pumping in London was laid down on a diagram. In the centre of London the depression amounted to 50 feet below Trinity high-water mark, at the Hampstead Road to 38 feet, and at the Zoological Gardens to 25 feet. This line, if produced, would shew a depression below the natural water-level at Kilburn, and fall into the non-depressed level about Cricklewood. Though it was impossible to prove the assertion that the water-level in the chalk would never assume a less inclination than 10 feet in the mile, he was led to the supposition by observing that the level ceased to decline when it became depressed to that extent; and many wells at a distance from the vent, which at the time of such depression contained only 3 feet of water, were never known to become dry.

Mr. Clark stated that he had found the water rise from the chalk to very different levels in the various wells and bore-holes which he had sunk, and he had not observed that the supply of water was affected so immediately after rain as had been described by Mr. Clutterbuck.

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He presented a paper, containing memoranda relative to wells sunk and bored for a considerable distance on both sides of the river Thames. This document gave the depths at which the chalk was arrived at and the water was found, and the height at which it stood in several wells around London. It stated also, that in London the average depth to the chalk was 220 feet; that the water generally rose to within 70 feet of the surface, but that near the river it rose to within 50 feet.

In some particular cases, such as at the Lunatic Asylum at Wandsworth, the depth to the chalk was 323 feet, yet the water rose to within 30 feet of the surface.

Mr. Davison presented a copy of a drawing, made in the year 1822, shewing the depth of sinking and of boring, and the height to which the water rose in ten of the principal wells in London at that period, which it was remarkable was exactly Trinity high-water mark. It appeared also that the water did not now rise in the same wells to within 50 feet of that point, shewing a depression of nearly 2 feet per annum.

May 16th, 1843.

The PRESIDENT in the Chair.

"Description of an improved form of the Journals of the Axles for Railways." By Captain Elias Robison Handcock.

THE paper commences by enumerating the principal disadvantages of the common railway axles, noticing particularly the great consumption of oil; the wear and tear, not only of the axles, but also of the boxes and the brasses; the oscillation occasioned by the wearing away in length of the latter, producing destructive effects alike to the engine, carriages, and rails, as well as being disagreeable to the passengers.

It then describes the new form of axle, which it is contended is calculated to remove these evils. The chief peculiarities of its form consist in substituting for the abrupt shoulder at either end of the journal, two cones; the outer one, which is loose on the axle, is capable of being forced forward by a screw on the extremity. It is prevented from revolving on the journal by means of a tongue, and is secured by a screw-nut and key. The two anti-friction collars of hard brass, which take the places of the ordinary journal brasses, are about $\frac{3}{8}$ths of an inch in thickness, and are fitted on the journal sufficiently loose to enable

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them to turn freely in the bored cast-iron boxes which support them. These collars extend over both the cones and along the journal till their ends meet within about a quarter of an inch in the centre; and acting as an independent moveable power between the journal and the cast-iron box into which they are fitted, they reduce the amount of friction when it becomes greatest. Among the advantages derived from this new form, are the uniform smooth and steady motion, consequently reducing the wear and tear; allowing the collars to be at all times tightened; avoiding the lateral action, which is detrimental to the carriages, and to the line of rails; the smaller consumption of oil, one pound of oil being found sufficient to lubricate a six-wheeled engine and four-wheeled tender while running a distance of nearly a thousand miles; and the absence of any tendency to heat. The paper concludes by expatiating on the benefits already found by experience to result from their use.

Captain Handcock exhibited the journal of a common railway axle, with its box and brasses, which had been in use, and pointed out that the principal abrasion had taken place at the ends; that a new brass for the same journal would require to be nearly an inch longer; and, therefore, that the oscillation of the carriage must necessarily be great, whenever the brasses began to wear. He explained that it was usual, in order to save the expenses of new brasses, to weld an iron ring upon the journal against the collar; and showed one, which had worn such a cavity in the end of the brass, as to bury itself completely within it. It appeared also that there was much wear, both on the journal and in the box; and that unless an axle possessed the means of having its brasses tightened up endways, oscillation and abrasion were inevitable.

A journal and its cones of the improved form, which had run over 21,000 miles on the South-Western Railway, exhibited no visible amount of abrasion, and Captain Handcock contended that the practice confirmed his previous ideas.

Mr. Field thought the form of the axles a decided improvement. They were somewhat on the principle of those which had succeeded so well for common roads, and he believed that they must prove of considerable advantage for railways.

Mr. Fairbairn approved of the construction of the journals, and had no doubt of their practical efficiency; he particularly

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liked the cones, as, in addition to their affording the means of preventing lateral motion and diminishing the friction, their form added strength to that point near the shoulder where it was most wanted.

Captain Handcock stated that the average consumption of oil on railways, was, for an engine and tender with common axles and brasses, about 6 lb. for 110 miles; of this quantity, 2 lb. were used for lubricating the axles.

General Pasley observed that his attention had been drawn to these axles, and although, on account of his official position, he scrupulously avoided giving any opinion on the merits or demerits of an invention, yet he might say, that if he were a proprietor of a railway, such was his opinion of Captain Handcock's axles, that he certainly would give them a trial.

"On the application of Zinc by the process of Electro-deposition, for the preservation of Iron, as applied to Engineering and other purposes."—By Frederick Pellatt.

The object of the paper is to direct attention to the properties of zinc as a protecting coating for iron; to describe the processes already employed for that purpose; the reasons of their failure, and the peculiar fitness of the process of electro-deposition of metal for the purpose.

Iron is, it is stated, from its superior affinity for oxygen, liable to rapid decomposition, and it has ever been a desideratum to discover some cheap mode of protecting it; the ordinary methods of painting and tinning not being sufficiently lasting.

By the laws of electricity, when metals are in contact, the negative metal is protected at the expense of the positive; and under all ordinary circumstances, zinc being the positive metal, it becomes a protector to the negative metal, iron. Zinc, like most metals in commerce, is not to be met with pure; in the other metals, however, the impurities do not generally tend to the injury of the metals with which they are combined; such, however, is not the case with zinc and its impurities, as, when in contact with moisture, they generate a galvanic action by which the zinc is rapidly destroyed.

Those who have made use of zinc, especially where it has been exposed to exciting fluids, such as milk, or any other fluid easily converted into acid, are well aware of the rapidity of its destruction.

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The impurities existing in ordinary zinc are then noticed, as well as the difficulty and costliness of the process of sublimation, in order to refine it. It is also contended that impure zinc, being in itself so easily destructible, is of little value, as it cannot afford protection to any other metal which may be coated with it: and therefore the mode of plating iron with melted zinc (of commerce), must be objectionable.

The Report made to the French Academy by Monsieur Dumas, is quoted, in which he says, "The zincing of iron by steeping it in a bath of melted zinc, has many inconveniences: besides, the iron combining with the zinc, constitutes a very brittle superficial alloy, the iron losing its tenacity. The presence of foreign matters used in the process, in order to keep the zinc in fusion, increases the amount of impurity, and being less fusible than the zinc, a great loss is created, in consequence of the zinc volatilizing at a high temperature.

It is well known that in the deposition of metals from metallic salts, by the electro-process, the pure metal only is deposited, so that the process described in the paper is not open to the objections against ordinary metallic coatings. The iron also being coated with zinc, in a cold solution, its state is in no way changed. The expense of the process is stated not to exceed that of four coats of oil paint.

Though to men of science the properties of zinc in connexion with other metals have been well known (and the opinion of Drs. Graham, Kane, Daniel, and Monsieur Dumas, are quoted on the subject), yet practically this knowledge has not been much applied, chiefly from the difficulty of obtaining pure zinc. The electro-process, it is stated, entirely overcomes the difficulty; at the same time it affords facilities for covering iron-work of any form or size, and as it requires no great outlay, the process may be carried on in any locality.

Zinc has another great advantage: although it is easily oxydized, the oxyde in ordinary circumstances is insoluble, and affords a protection to the metal below. For roofing and many other purposes, of which a long list is given, it is suggested that zinced iron would be found very useful.

Mr. F. Pellatt exhibited a number of specimens of iron, covered with zinc and copper, by the process of electro-deposition, which he described. The pieces of iron were first rendered perfectly

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clean and free from oxyde, by plunging them into a bath of heated sulphuric acid and water; they were then placed in a cold solution of sulphate of zinc. The positive pole of a galvanic battery being attached to a zinc plate, and the negative pole to the piece intended to be covered with metal, the deposition commenced equally all over it, and was continued as long as was considered necessary. By this process the pure metal alone could be deposited; and the amalgamation of the zinc and iron, which occurred when the iron plates were dipped into melted metal, was avoided. For zincing, he preferred an acid to an alkaline solution of the metallic salts. Some thin plates, which had been exposed for eight months on roofs in London, did not exhibit any appearance of rust. The process could be applied on any scale, as all the apparatus that was necessary was some wooden troughs, to contain the solution and the pieces of metal to be covered.

He had not made accurate experiments as to the efficacy of the process when applied to iron exposed to the action of sea-water; but he feared the result, on account of the formation of muriate of zinc.

The President said that the subject was one of great importance to engineers, as, if the deposited coating were found to stand the test of time, it would enable the use of iron to be extended; but the main point to which he would direct Mr. Pellatt's attention, was the defence of cast iron from the destructive action of sea-water.

May 28, 1843.

The PRESIDENT in the Chair.

No. 638. "Account of some Egyptian Bricks from the Pyramids of Dashoor," by J. Perring. Communicated by William Newton, Assoc. Inst. C.E.

THE author states that the ancient Egyptians used bricks for every purpose, except the erection of temples and tombs; that they were generally crude bricks dried in the sun, and in the dry climate of Egypt they sufficed for all ordinary purposes. The only instances in which he found they had been subjected to the action of fire, were for a quay wall, and for the foundations of a town near the Nile, in a damp situation.

From the drawings in the tombs, and the narrative of Holy Writ, it would appear that the captives were generally employed

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in manufacturing bricks, and, as many are found with the name of the reigning monarch stamped upon them, it is not improbable that they constituted a government monopoly. It is a curious fact in connexion with the Biblical account of the labours of the Jews, that more bricks bear the stamp of Thothmes III. than of any other monarch; and, according to Wilkinson and other learned authors, it was during his reign that the exode of the Israelites took place.

The bricks, which are 16 inches long, 8 inches wide, and about 5 inches thick, are made of the alluvial soil of the valley of the Nile, mixed up with chopped straw to bind the whole together. They were formed in wooden moulds, and dried in the sun. It would appear from drawings, that the earth was tempered and the straw was mixed in, by men treading the mass with their feet. With such bricks as these the Egyptians formed the walls of their towns, using the alluvial earth also as mortar.

The author states that he found some remarkably well-formed arches, of 12 to 14 feet span, built in concentric half-brick rings, at Thebes, the bricks of which were marked with the name of Sesostris; consequently, they must have remained uninjured by time upwards of 3180 years. They have all a cavity in the sides to retain the mortar, similar to what is practised in modern bricks.

The pyramid from whence these bricks were taken, was built, according to Herodotus, by a king named Asychis, who lived about 2000 years before the Christian era. The body of the pyramid is composed entirely of crude brick, but it had an external casing of limestone as a protection from the action of the weather. The author says that not a single brick appears to have settled from its place, and that it is difficult to imagine a mass more solid and compact, in spite of the great pressure the bricks had to support in a pyramid 215 feet high.

Mr. Davison presented a piece of copper pipe, six inches diameter, through which the wort had been forced during a considerable period, at Messrs. Truman, Hanbury, and Co.'s brewery. It was nearly stopped up by a deposit of a black substance, which opposed such resistance to the passage of the fluid as to induce an examination of the pipes, and the discovery of their state.

Dr. Ure said that the deposit was a good example of what Leibig called 'Eremacausis'—product of slow combustion. The

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substance was a carbonaceous matter, resulting from the slow combustion of the gluten and starch contained in the brewers' worts.

ON THE LAWS RELATING TO LETTERS PATENT FOR INVENTIONS.

No. XI.

THE PATENT LAWS OF THE ROMAN STATES, OR STATES OF THE CHURCH.

THE northern part of Italy forming a portion of the Austrian empire, the same laws relating to patents for inventions extend over these States. The country immediately adjoining and south of this part of the Austrian dominions, is generally denominated the Roman States, or the States of the Church, the patent laws of which country we are about to consider. The Roman law is, in our opinion, the most equitable of all the continental patent laws. It has evidently received a great deal of consideration, and the patentee is adequately protected, whilst, at the same time, the public is secured from any injurious monopoly, without at all infringing upon or circumscribing the rights that every inventor is justified in claiming or expecting from his Government. The law in the Roman States is justly severe upon the subject of infringement; and the only point which appears to call for any amelioration, is the clause binding the patentee to put his invention into practice within one year from the public notice of his patent, in the official journals. This, however, is a regulation in common with all the continental patent laws; and although the policy of adopting it seems to be universally conceded on the continent, its propriety appears to us to admit of very considerable doubt. In some countries, the time allowed for putting an invention to work is longer than others; and if the patentee can prove that circumstances, over which he had no control, have prevented his complying with this condition, he may obtain a prolongation of the time allowed for working the invention. This does not, however, appear to be the case in the Roman States; and even should this regulation be complied with, any omission to work the invention for twelve months, during the term of protection granted, will of itself be sufficient to invalidate the patent. Patents are granted in the Roman States, as in most other con-

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tinental countries, for three different classes of inventions,—namely, new inventions, improvements, and importations. They may also extend over the whole of the States, or be restricted to a particular portion of the country.

The following is a translation of the law at present in force in the Roman States relative to this subject :—

CHAPTER I.

On the nature of, or different kinds of Patents; their extent, duration, and prolongation; persons who may obtain them; and the formalities required to be observed in making application for patents.

ART. 1. *Patents of invention* may be obtained for, 1st,—any new and important kind of manufacture; 2nd,—any new and useful art not previously known; 3rd,—any new and useful process in agriculture or manufactures; 4th,—any new natural product; 5th,—a novel application of known means.

ART. 2. *Patents of improvement* are granted for any useful or beneficial improvement or alteration, made in or upon any invention known and in use in the Roman States.

ART. 3. *Patents of importation* will, upon application being made in the proper form, be granted for the importation or introduction, 1st,—of inventions already patented in a foreign country, and for which patents are yet in force; 2nd,—inventions known and practised freely in foreign countries, but which are neither known nor used in the Roman States.

ART. 4. *Persons who may become patentees.*—Any individual, whether a citizen of the States of the Pope or a foreigner, man or woman, whether of age or a minor, can obtain a patent of invention, improvement, or importation, upon attending to and fulfilling the formalities and conditions prescribed by the granting of these privileges. Any person who obtains a patent in the Roman States, can, if he wishes so to do, immediately afterwards take patents for the same invention in other countries, without endangering the validity of his patent in the Roman States.

ART. 5. *Patents of invention* and of *improvement* are granted for a term which varies from five to fifteen years, according to the request of the applicant.

ART. 6. *Patents of importation* for the introduction of inventions or processes patented abroad, are granted for a term equal to that which remains unexpired of the foreign patent, so that both patents shall expire at the same time. Patents of importation for processes in foreign countries are not granted for a longer term than from three to five years.

ART. 7. *Extent of Patent Right.*—The Government will take

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into consideration the importance of the invention or improvement, the probable expense of establishing the invention, and the advantages which are likely to accrue therefrom; and according to these circumstances, the patent will be extended over the whole of the Roman States, or be confined to any single part thereof.

ART. 8. *Prolongation of Patents.*—Any person, having obtained a patent for less than fifteen years, or less than five years, can obtain a proportionate prolongation of patent right, provided he can prove that he has incurred heavy and unforeseen expenses during the existence of the patent, and provided that it shall be considered that such prolongation will be a public benefit.

ART. 9. *Formalities to be observed in applying for Patents.*—A petition must be drawn up, containing the title of the discovery, invention, method, or improvement in question, and also pointing out the advantage the State will derive therefrom; and if any public or private interests are likely to be affected, mention must be made thereof in the application. The petition must be accompanied by a description of the invention, discovery, or improvement, and a duplicate copy of the same, drawn up in such a clear and complete manner, that the said invention may be put in practice by any intelligent agriculturist or manufacturer. The whole must be enclosed in an envelope, bearing the seal of the applicant, and indicating the date on which the application was made, and also the nature of the invention.

This packet must be deposited with the local authority, who is bound to countersign the above-mentioned date, and can neither refuse nor delay this formality, which, when once done, establishes the priority of the discovery or invention. This packet is then transmitted to the Government, who cause the patent to be made out and published in the *Diario di Roma*; notice is also given thereof to the Cardinals and Prelates of the Legations.

CHAPTER II.

Obligations of a patentee, and the annual tax which he is bound to pay; rights of the patentee; causes of invalidity; actions for rescinding patents; expiration of the patent right.

ART. 10. *Obligations of a patentee.*—A patentee is bound to work or practise his invention within a year from the date of the grant, and not to suspend his operations for the space of one year at any time while the patent is in existence.

ART. 11.—*Payment of tax.*—He is further bound to pay the Government tax for granting the patent, and which must be done in two portions,—the first upon the issue of the patent, and the second in the first month of the second half of the term of the patent.

ART. 12. *Tax upon patents.*—The Government tax is fixed at

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so much per annum, and no difference in this annual tax is made between patents for different terms. It varies, however, according to whether the grant is for a patent of invention or a patent of importation. The tax is at the rate of ten Roman crowns per annum for a patent of invention or of improvement, and fifteen Roman crowns per annum for a patent of importation.

ART. 13. *Rights of a patentee.*—The patent, when produced, is good evidence in a court of justice, as far as regards the grant and date of the patent; but does not, in any way, guarantee either the merit or utility of the invention for which the patent is granted. The patentee has, from the date of the publication of his patent, the exclusive right to put in practice his invention or discovery without any person being able to molest him in the enjoyment thereof, during the whole term. He can also, while the patent is in force, dispose of his right in the same manner as any other property; transfer it to another person; enter into partnership with a third party, for the purpose of working the invention; or he may make partial transfers or grant licenses to work the invention. He has the right to prosecute all infringers before the competent tribunals, and to obtain damages from them. All articles declared to be infringements are forfeited, one half for the benefit of the patentee, and the other half for the accuser, or for the benefit of the public prosecution.

ART. 14. *Causes of invalidity.*—The patent ceases to have any effect, either as regards the patentee or any third party, in the following cases:—1st, If it is decided that the discovery will injuriously affect public security, safety, or industry; 2nd, If it is proved and decided that the pretended discovery was not new in the Roman States at the time the application for the patent was made; 3rd, If the method or improvement was known through the medium of a printed description, or had been the subject of a patent of invention in other countries, without this circumstance having been mentioned in the petitioner's application; 4th, If in the description presented by the petitioner, he shall be convicted of any dissimulation, or attempt to alter, falsify, or withhold any of the means necessary for the proper and economical use and application of the invention or discovery; 5th, If a full year shall be suffered to expire since the publication of the patent, without the discovery or invention being put in practice; or if the execution or working shall have been suspended for the like space of time, during the existence of the patent; 6th, If the patentee shall allow one month to elapse after the expiration of the time appointed by Article 11, without paying the tax; 7th, If at examination of the samples or specimens of the produce of the invention, which must take place yearly before the local authorities, any objectionable alteration or change should be discovered in the produce or manufacture of the patentee.

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ART. 15. *Actions for repealing patents.*—An action of this kind may be instituted by any individual who, from any supposed defect in the novelty of the invention, or from other causes, may be desirous of contesting the patentee's right. Actions of this description must, however, be commenced within the space of six months from the date of the patent; after the expiration of which time, they cannot, on any account, be admitted or entertained.

ART. 16. *Expiration of the patent right.*—After the expiration of the patent; or if it should happen to be rescinded or repealed from any of the above-mentioned causes, the description of the invention is made public, and notice thereof is given to the legations or sub-legations; and the art or manufacture, which was before patented and protected, is then thrown open to public use in the Roman States.

Scientific Adjudication.

JURY COURT OF SCOTLAND.

BEFORE THE LORD PRESIDENT AND A SPECIAL JURY.

May 10th to 20th, 1843.

J. B. NEILSON AND OTHERS *v.* W. BAIRD AND OTHERS.

Counsel for the Pursuers:—The Dean of the Faculty of Advocates (Patrick Robertson, Esq.), Andrew Rutherfurd, Esq. (late Lord Advocate), the Solicitor-General (Adam Anderson, Esq.), and John Inglis, Esq., Advocate.—*For the Defenders*:—The Lord Advocate (Duncan M'Neill, Esq.), Robert Whigham, Esq., Charles Neaves, Esq., P. Mure M'Credie, Esq.

THIS was one of the many trials that have been occasioned by infringements of the patents obtained by Mr. Neilson, in England, Ireland, and Scotland, in 1828, for employing hot-air blast in the manufacture of iron. It occupied ten days, and, consequently, a verbatim report of the trial would occupy too much of our space. We have therefore given an abstract of the same, with the issues sent to the jury, which are as follows:—

It being admitted that, on the 1st day of October, 1828, the pursuer, James Beaumont Neilson, obtained letters patent under the Great Seal used in Scotland, in place of the Great Seal thereof, and duly enrolled a specification, in terms of the proviso contained in the said letters patent, being Nos. 30 and 31 of process. It being

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also admitted that the pursuers, other than the said James Beaumont Neilson, have acquired, by assignment from him, a joint interest in the said patent. Whether, in the course of the year 1840, and between the 27th day of March and the 7th day of May, in the said year, and during the currency of the said letters-patent, the defenders did, in or at their iron-works at Gartsherry, by themselves or others, wrongfully, and in contravention of the privileges conferred by the said letters-patent, use machinery or apparatus substantially the same with the machinery or apparatus described in the said specification, and to the effect set forth in the said letters patent and specification, to the loss, injury, and damage of the pursuers?

Or,—1. Whether the invention, as described in the said letters-patent and specification, is not the original invention of the pursuer, the said James Beaumont Neilson? 2. Whether the description contained in the said specification is not such as to enable workmen, of ordinary skill, to make machinery or apparatus capable of producing the effect set forth in the said letters-patent and specification? 3. Whether machinery or apparatus, constructed according to the description in the said letters-patent and specification, is not practically useful for the purposes set forth in the said letters patent? (Signed)

July 5, 1842. D. BOYLE, I. P. D.

The damages are laid as under:—

Profits claimed, as at the date of action ..	£10,000
Other damages, as at the same date	10,000
Total damages laid.....	£20,000

Edinburgh, March 4, 1843.—The Lords having heard counsel on the respective motions for the parties, ordain the minutes for the pursuers, dated 4th July, and 16th November, both last, Nos. 46 and 52 of process, to be engrossed on the issues in this case as relative thereto. (Signed) D. BOYLE, I. P. D.

July 4, 1842.—Rutherfurd, for the pursuers, stated to the court, he agreed that, under the first issue, it shall be competent to the defenders to try the issue of public use.

(Signed) AND. RUTHERFURD.

Nov. 16, 1842.—Rutherfurd, for the pursuers, agreed that it should be competent for the defenders, in the trial of the issues, as adjusted in this case, to state any objection in point of law to the validity of the patent and relative specification, founded on the nature of the claim and statement there made on the part of the patentee, and that the court should decide the same, by way of direction, in the course of the trial.

(Signed) AND. RUTHERFURD.

The question regarded the validity of the patent obtained by

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Mr. Neilson, in 1828, "for the improved application of air, to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required." In the specification of which patent, Mr. Neilson proposed that the blast should be heated in its passage from the blowing apparatus to the furnace, and delivered hot, instead of cold, as formerly practised. This was to be accomplished by placing one or more vessels, or air receptacles, between the blowing apparatus and the furnace, and heating those vessels externally in a considerable temperature. "It is better, says the patentee, "that the temperature be kept to a red heat, or nearly so; but such a temperature is not absolutely necessary to produce a beneficial effect." When this invention was first made public, it was received with general distrust, and even ridicule; the prevailing opinion in the scientific world, and among the ironmasters, both in this country and abroad, having been, that the blast could not be too cold when it entered the furnace. This opinion was so far supported by the practical experience of the time, it having been remarked that the iron smelted better in winter than in summer. These prejudices were, however, dispelled, as soon as Mr. Neilson's invention was seen in operation, and producing such prodigious results in the production of iron.

The power of hot blast in the fusion of the materials in the furnace was such, that the product was doubled—*i. e.* a furnace produced as much in twelve hours, with the hot blast, as it had done in twenty-six hours with the cold; and it was also found that this beneficial result was generally accomplished with one-half less fuel, and one-third less flux, or limestone. As regards Scotland, the great advantages of this invention were manifested in a remarkable degree. In1828, or before the date of the patent, the total quantity of iron produced in Scotland, in one year, was about 60,000 tons; in 1840, the total quantity had risen to about 300,000 tons, being five times the produce of 1828. This vast advance was mainly, if not exclusively, attributable to the hot-blast, which had entirely superseded the cold—not a single furnace in Scotland being worked, in 1840, or at the present time, by the cold blast, with the exception of one at the Carron Works, and which is for their own exclusive use, the pig-iron produced thereby not entering the market. Another important illustration of the advantages of Mr. Neilson's invention was its effect on the English iron market. In 1830, the total imported iron at Liverpool was 8980 tons, of which there was from Clyde, or Scotland, 3180 tons; in 1841, the total import at the same port was 37,304 tons, of which there was from Clyde 30,899 tons; in 1830 the total import of iron at Runcorn (the other great emporium, in England, of the iron trade) was 3974 tons, of which from Clyde there were only 11 tons; in 1841, the total import at Runcorn was 18,161 tons, of which from Clyde, or Scotland, there were 14,366 tons—and

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every ton of which was, of course, manufactured by the hot blast, there being then no cold blast furnaces in operation in Scotland.

During the greater part of the currency of the patent, which lasted from October, 1828, to October, 1842, all the ironmasters in Scotland, and also those in England, who adopted the hot blast, took out licenses from the patentee, paying 1*s.* per ton on the iron smelted by them, for the use of the invention. Latterly, however, the patent has been challenged, both in England and Scotland, and on various grounds. It was stated by the counsel of Mr. Neilson, at this trial, that he had as yet succeeded in establishing his patent, having triumphed in every instance, and obtained damages from the parties working the hot blast without his license, and who were thereby declared to have wrongfully used his invention, or invaded his patent. In these actions, as in the present, against the Messrs. Baird, of Gartsherry, the defence resolved into various allegations. It was argued, at this trial, that the patent was void, as being only for a principle; or, in other words, it stated, in effect, that hot air was better for smelting iron than cold air, without fulfilling the conditions of the law, by clearly specifying the practical mode in which this was to be accomplished; that, in fact, the patent merely embodied a principle, without clothing that principle with any practical effect, in order to render the patent valid. Further, assuming that the specification did profess to set forth a practical mode of executing the invention, still the patent was alleged to be void, because this mode, if followed, would lead to a false or impracticable result. Then it was alleged that Mr. Neilson was not the original inventor, seeing that the hot blast had been practised at other places, and that it was publicly known previous to the date of the patent. This did not imply, and the Lord Advocate, as leading counsel for the Messrs. Baird, disclaimed the idea, that Mr. Neilson had borrowed the discovery from another, but simply, that the invention might be original, as regarded the merit of Mr. Neilson, but still not the subject for a patent, if it turned out that it had been previously known and publicly used or disclosed by others, though such prior discovery was totally unknown to Mr. Neilson. The validity was also challenged, in respect that the directions in the specification would not, as the law requires, enable workmen of ordinary skill in such matters to construct an apparatus useful for the purposes set forth in the patent.

The DEAN OF THE FACULTY OF ADVOCATES (Patrick Robertson, Esq.) detailed the whole circumstances of the case, and the various proceedings in the Court of Session and House of Lords. He contended for the validity of the pursuers' patent—he undertook to prove that the defenders, by themselves and others, had invaded or taken advantage of it, whereby they had made great gains, or profits, and that they were justly liable to make reparation to the pursuers.—He concluded by calling upon the jury to find accordingly.

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Evidence was then brought in support of the issues for the pursuers, which occupied the court from Wednesday till the Monday following. This evidence consisted of practical and scientific men from all parts of the kingdom.—At its conclusion,

The LORD ADVOCATE OF SCOTLAND (Duncan M'Neill, Esq.) opened the case for the defenders, by a speech, in which he analysed the evidence of the pursuers, and undertook to prove that the pursuer, Mr. Neilson, was entitled to no credit for his invention, because the hot blast, for which he obtained the patent, was in use, and well known, before the date of it; that the patent itself was void in law; and that no damages were exigible by him, or by the pursuers, from the defenders.—The evidence brought in support of the defence occupied the court from Tuesday till the afternoon of Friday.

A. RUTHERFURD, Esq. (late Lord Advocate of Scotland), then replied on the evidence, and on the whole case for the pursuers; he called upon the jury to protect his clients, whose legal and just rights had been invaded by the defenders, amongst others, and to give exemplary damages under the issues.

The court then adjourned till the following day (Saturday).

The LORD PRESIDENT having resumed his seat on the bench by half-past twelve o'clock, proceeded to charge the jury in a luminous, straightforward, and able manner. His Lordship's address occupied three hours and a half.

The LORD ADVOCATE, on behalf of the defenders, having taken several exceptions to the views of the Lord President, the jury retired at half-past four, and, at six o'clock, returned the following VERDICT (unanimously finding in favour of the pursuers in all the issues):—£7000. damages, and £4867. 16*s.* profits—making in all £11,867. 16*s.* The £4867. of profits being on 4392 tons of iron, manufactured within six weeks, the period specified in the present action.

PRIVY COUNCIL.

BEFORE LORD BROUGHAM, LORD CAMPBELL, AND THE CHIEF JUDGE OF THE ADMIRALTY COURT.

June 21*st*, 1843.

SOAMES' PATENT.

THIS was an application to the Judicial Committee of the Privy Council, made by James Soames, Jun., of Wheeler-street, Spitalfields, soap-maker; and also by William Wilson, John Studholme Brownrigg, John Cockerell, and Sir George Gerard de Hochepied Larpent, Bart., all of Belmont, in the Wandsworth-road, Surrey, patent cocoa-nut candle and oil manufacturers, and cocoa-nut

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oil merchants, trading in partnership under the firm of "Edward Price and Co.," for an extension of the term of a patent which was granted to James Soames, Jun., in 1829*, and of which the four last petitioners are assignees, for a method of treating cocoa-nut oil, whereby the elaine and stearine are separated from each other by pressure,—the elaine being used for burning in lamps, and other purposes, and the stearine for manufacturing candles.

Sir T. Wilde, Mr. M. D. Hill, Mr. Rotch, and Mr. Webster, appeared in support of the application; which was opposed by Mr. Erle, and Mr. Swan, on behalf of Mr. Tindall (against whom an injunction had recently been granted by the Master of the Rolls, for an infringement of the patent); and by Mr. Montague Smith, on behalf of several gentlemen engaged in the tallow trade.

In support of their application, the petitioners stated, that notwithstanding the exertions made by the British Government to promote the importation of cocoa-nut oil, (especially by sending out machinery to Ceylon, in 1813, and by afterwards erecting a mill near Colombo, and importing the produce thereof into England,) those efforts were not attended with success, because the cocoa-nut oil loses its fluidity on leaving the tropical countries where it is produced, and congeals, at the ordinary temperature of the English climate, into a state of consistence resembling that of butter—neither sufficiently solid to be made into candles, nor sufficiently fluid to be used for burning in ordinary lamps, or for oiling machinery; but, by the invention of James Soames, Jun., the essential defect of the crude oil was removed, by separating it into two distinct products; whereof one is solid, and adapted for the manufacture of candles, and the other fluid, and applicable to burning in lamps, oiling machinery, &c.

The petitioners further stated, that they were prevented from realizing the profits which they expected would arise from working the invention, by an insufficient supply of crude cocoa-nut oil; that the means of supply were at the same time suddenly contracted, by the discontinuance of the Government mill in Ceylon, about 1832; that, having failed in their endeavours to purchase the Government mill, they made arrangements for the erection of a mill near Colombo, which has lately been completed at a great expense, containing three steam-engines and twelve pairs of edge-stones, besides hydraulic presses, stampers, and other machinery, and being capable of producing 2500 tons of cocoa-nut oil per annum; that, by a change in the Ceylon tariff, in Jan. 1837, a sudden and unexpected transition was made from a high protection to an absolute discouragement of the production of cocoa-nut oil in Ceylon; that, for the purpose of ensuring a constant supply of cocoa-nut oil, they were obliged to purchase waste land in Ceylon, and plant it with cocoa-nut trees; that they have benefited the public, by furnishing them with candles, (formed of

* For description of this invention see Vol. V. of our Second Series, p. 148.

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a mixture of the stearine of cocoa-nut oil with the stearic acid of tallow, and known as "Edward Price and Co.'s Patent Composite Candles") equal, in their burning qualities, to wax and spermaceti candles, at the retail price of one shilling per pound, which is less than one-half the ordinary price of those candles; that they have enjoyed undisputed and undisturbed possession of their said patent rights, except so far as such possession has been invaded by Mr. William Tindall, who, being a large shipowner, engaged in the Ceylon trade, was induced, on the aforesaid change in the Ceylon tariff, to import copperah into England, and to establish a factory near London for the purpose of grinding and crushing it, and expressing the crude oil therefrom, which he continued to do for nearly a year, up to September, 1841; that in September and October, 1841, the said William Tindall made various preparations for repressing the oil, extracted by him from the copperah, and for manufacturing cocoa-nut candles, but the petitioners could not obtain any sufficient evidence of direct infringement until November, 1841; that an injunction was then obtained against him, the plaintiffs being put under the usual terms of bringing an action at law to try the validity of the said letters patent, and that their declaration in the said action at law was delivered on the 3rd of January, 1842; that, in the mean time, the said William Tindall had been engaged in endeavouring to separate the cocoa-nut oil into stearine and elaine, by operations upon the copperah itself,—that is, by grinding it very small, and then pressing it at various temperatures, for which process he applied for letters patent; and, when the said letters patent were nearly completed, he informed the petitioners of his intention to manufacture a material for cocoa-nut candles and liquid cocoa-nut oil direct from the copperah. Whereupon the petitioners moved to commit the said defendant for breach of the injunction; and, on the 21st of January, judgment was given that the defendant had committed a breach of the injunction, time being allowed him to file an affidavit in explanation; and, on the 27th of the same month, an affirmation having been filed, whereby it appeared that the defendant's breach of the injunction was not wilful, he was only ordered to pay the costs of the application.

The petitioners also stated, that they have incurred an expense of many hundred pounds in the said proceedings; and that, although they have invested a capital of £100,000 in the said patent business, their profits have been much less than the ordinary returns of manufacturing capital.

In conclusion, the petitioners prayed for the prolongation of the letters patent for the following reasons:—"First.—Because they have introduced a new trade and manufacture into this country,—namely, the trade and manufacture of vegetable candles, and have thereby rendered a production of a part of the realms of your Majesty of great value to the arts.

"Secondly.—Because they have been the practical founders of

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the trade in cocoa-nut oil, which the Government of your Majesty's predecessors had endeavoured in vain to establish, and which is a trade of great value to the colony of Ceylon, and beneficial to the shipping interest, besides producing some, though at present an inconsiderable, accession of revenue.

"Thirdly.—Because the application of cocoa-nut oil to the manufacture of candles will, in its further development, diminish progressively the importation of tallow from Russia.

"Fourthly.—Because your petitioners have conferred an important benefit on the public, by bringing good light within the reach of the body of consumers.

"Fifthly.—Because the important changes which your petitioners themselves introduced, deprived them of their reward, by occasioning a scarcity of the raw material.

"Sixthly.—Because the adverse and other circumstances hereinbefore stated, and over which your petitioners had no control, have subjected your petitioners, William Wilson and his said partners, to hardships of the severest description.

"Seventhly.—Because the profits derived from the said invention having been much less than those of an ordinary manufacture, your petitioners are wholly without reward for the expenditure of their time and skill, and for the sacrifices made by your petitioner, William Wilson, as hereinbefore stated, and for the benefits conferred on the country by the establishment of the new trade and manufacture.

"Lastly.—Because your petitioners, William Wilson and his said partners, were harassed in the last two years of their patent right by vexatious and expensive litigation."

On the part of the opponents to the petition, it was contended that no ingenuity had been displayed in the invention; that there was therefore no public benefit in the thing invented; and that the petitioners had already received a sufficient remuneration; that the manufacture of sperm oil and spermaceti from animal fat was commonly effected by precisely the same means as those detailed in the specification of the patent; and it had been laid down as a principle by scientific writers, for a long period prior to the date of the patent, that the same process was applicable to all vegetable oils.

Their Lordships, after a short consultation, decided on extending the patent for three years, instead of seven, as prayed for by the petition.

BEFORE LORDS BROUGHAM AND CAMPBELL, SIR JAMES LEWIS KNIGHT BRUCE, DR. LUSHINGTON, SIR ALEXANDER JOHNSTONE, SIR HYDE EAST, AND SIR EDMUND RYAN.

July 5th, 1843.

WRIGHT'S PATENT.

THIS was an application by Mr. Samuel Wright for an extension

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of the patent granted to him, January 26th, 1830,* for "a manufacture of ornamental tiles, bricks, and quarries, for floors, pavements, and other purposes." The principal object of the patent was the manufacture of encaustic tiles, which were made extremely hard and with great exactness and uniformity, by means of the above invention. The petitioner stated that he had experienced great difficulty in introducing his invention to the public; that he had expended £1190, from which he had only received £332, leaving an actual loss of £858; that the manufacture would no doubt have been dropped altogether, but a large potter, named Minton, had lately taken the thing into his hands, and was preparing to embark in it on a large scale, under an arrangement with Mr. Wright; that there was now every prospect of the tiles coming into extensive use, Mr. Minton having laid the floor of the Temple Church with them; and Mr. Barry had recommended that the floors of the new Houses of Parliament should be laid with them.

There being no opposition to the petition, the Court, after a short deliberation, decided upon extending the patent for the full period of seven years.

VICE CHANCELLOR'S COURT.

July 27th, 1843.

BACK v. RENNIE.

THIS was an *ex parte* application for an injunction, on behalf of the Ship Propeller Company, (who sued by their secretary, Mr. Back,) to restrain the defendants (Messrs. Rennie) from infringing a patent, obtained by Mr. F. P. Smith, in 1836,† for propelling vessels by means of the Archimedean screw-propeller.

From the statement of Mr. Bethell, who made the application, it appeared that the merits of the invention were first tested in the *Archimedes*, a vessel built for that purpose, and fitted up by Messrs. Rennie with a propeller, according to the patent. The trials made with this vessel having been very satisfactory, the Ship Propeller Company became desirous that the invention should be generally known; and having obtained an assignment of the patent, they granted a licence to the Commercial Steam Navigation Company, on condition that they procured vessels to be fitted with the propeller of Mr. Smith. Accordingly a vessel, called the *Mermaid*, was built, and several trials of the invention were made in her; after which she was transferred to Mr. Rennie, and, in June last it came to the knowledge of the plaintiff that Messrs. Rennie had caused to be unshipped from that

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* For description of this invention see Vol. VI. of our Second Series, p. 79.

† See Vol. IX. of our Conjoined Series, p. 98.

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vessel the propeller originally made for her according to the invention of Mr. Smith, and were fitting her with machinery of their own. Some time elapsed before the exact manner in which the machinery was constructed could be detected; but it was ultimately discovered that they were substituting a propeller made on the same principle as that secured by the letters-patent, but slightly modified.

The learned counsel then went minutely through the specification, and, after explaining to his Honour the principle of the invention, observed, that it appeared to him, according to the affidavit, that the screw, which the defendants had applied to the *Mermaid*, was identically the same as that for which the patent had been obtained.

The Vice-Chancellor, after a minute inspection of the models of the machinery, expressed his opinion that there had been an invasion of the patent, and directed the injunction to issue.

BEFORE SIR J. WIGRAM.

Nov. 10*th*, 1843.

WARD *v.* KEY.

THIS was an application for a special injunction, to restrain the defendant from infringing the plaintiff's patent, granted to him in 1837,* for an invention for facilitating the tuning of drums, and improving their tone. The improvement in tuning consisted in performing this operation by means of a cord, passed through several holes in the hoops of the drum, and connected with a screw, which effects, at one operation, and instantaneously, the object of tightening the drum head. And the tone of the drum was rendered more perfect by making a series of holes around it, instead of the ordinary single air-hole. The plaintiff, who is a musical instrument maker, had, according to the affidavits, communicated his invention to the defendant, also a musical instrument maker, and the latter had purchased a pair of the plaintiff's drums. In September, 1842, the plaintiff discovered that the defendant had made and sold to the band of the 60th Regt. some drums made on the principle of the patent, with iron wire applied instead of cord, as the medium for tightening the instrument. The defendant did not appear by counsel to oppose the motion; but as the notice of the application had only been given on the day previous to the application, the court granted the injunction, to be issued on the next seal day, provided the defendant did not, in the interval, apply to discharge the order.

On the 16th of November, the injunction was issued, the defendant appearing, but not being prepared to oppose the motion.

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* For description of this Invention, see p. 415 of our present Volume.

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ROLLS COURT, WESTMINSTER.

November 16th and 17th, 1843.

SEALY *v.* BROWNE.

Mr. P. LEIGH and MR. ELDERTON were for the plaintiff, and Mr. TURNER and MR. GIFFORD for the defendants.

THIS was a motion for an injunction to restrain the defendants, William and John Browne, of Bridgewater, from manufacturing or selling any tiles of a form similar to those secured under letters patent, granted to the plaintiff in 1842,* and which he calls his single-channelled flat tile, and his double and treble-channelled tiles, or of any other form colorably varying therefrom. The plaintiff had been trying experiments for some time previous to obtaining the patent, during which period the defendants had obtained a tile manufactured by him, and had immediately commenced manufacturing tiles similar to his in every respect. Upon obtaining letters patent, the plaintiff gave the defendants notice of that fact, and required them to desist, which they did not; and the present proceedings were taken to obtain an injunction.

The defendants denied that the patent was valid, for, in 1829, F. H. M. Drake obtained a patent† for a single-channelled flat tile, exactly similar to the plaintiff's; and from the 29th of September, 1841, to the 1st of May, 1842, drawings of Waghorn's single-channelled flat tiles were exposed to public view at Bridgewater, by his brother, who keeps the Railway Hotel. It appeared also, that in 1838, 10,000 were put upon a house of Lord Tankerville's, and a manufacturer named Peake had also sent a similar tile from Staffordshire, in 1842, to Messrs. Parker and Wyatt, in London. As to the double and treble-channelled tiles, they were nothing more than the common pantile, with an increased number of channels, which were somewhat reduced in size. The plaintiff, however, long before the date of his patent, had sold these tiles to the public, and 80 of them had been purchased by Mr. Paley, and placed upon a barn at Birchpool farm, where they still remained.

LORD LANGDALE refused to grant the injunction, and said, that the case must stand over, with liberty to the plaintiff to bring an action at law, to try the validity of the patent; and, in the mean time, the defendants must keep an account of the tiles manufactured by them.

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* For description of invention, see p. 263 of our present Volume.

† For description of this patent, see Vol. IX. of our Second Series, p. 28.

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LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

Nov. 29. *Frederick Finlay*, of 34, Bloomsbury-square, for a cast-iron fire-proof strong room.

30. *John Shipley*, of 181, Regent-street, for a bit for horses.

30. *Messrs. Evans & Colley*, of Cripplegate-buildings, Fore-street, City, for an improved parasol.

Dec. 2. *Thomas Phipson & Sons*, of Broad-street, Birmingham, for a toilette and pocket pin-holder.

2. *Isaac Hewitt*, of Greek-street, New Radford, Nottinghamshire, for an occasional friction stopping apparatus, to be applied as an improvement to the figuring apparatus of lace-making machines.

2. *William Muir*, of the Achilles Steamer, Glasgow, for an improved self-acting lubricator.

5. *Henry Cobby*, of the General Steam Navigation Company's Office, Kingston-upon-Hull, for apparatus for causing the paddle-wheels of a steam-vessel to revolve in a contrary direction to each other at one time, and thereby to turn the vessel round.

7. *John Richardson*, of 62, Edgware-road, for an improved chimney cowl.

7. *Joseph Rock Cooper*, of Birmingham, for a many-barrelled revolving pistol and gun.

7. *Thomas Edge*, of Great Peter street, Westminster, for a design for a two-light gas-meter.

8. *James Tyzack*, of Wells, Norfolk, for "The British Razor."

9. *James Martin*, of Camden-town, for an improved ring gas burner.

13. *William Middleton*, of Birmingham, for a wheel for railway carriages.

13. *Messrs. Jeakes & Willis*, of Great Russell-street, Bloomsbury, for an improved roasting jack.

14. *John Galley Hartley*, of 3, Narrow-street, Limehouse, for bedding.

14. *William Middleton*, of Birmingham, for wheels for railway carriages.

19. *Christian Homeyer*, of Liverpool-road, Clerkenwell, for fastenings for trowser-straps and chains.

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Dec. 22. *Edward Batten Walmsley*, of the Phœnix Foundry, Southwark, for an improved axletree for all kinds of vehicles.

23. *George Betjemann*, of 6, Ashby-street, Northampton-square, Clerkenwell, for self-acting trays or drawers, applicable to dressing-cases, writing-desks, ladies' work-boxes, work-tables, and all cabinet and other work, in which trays or drawers are used.

23. *James Boyd*, of 78, Welbeck-street, Cavendish-square, London, for the "Himalaya funnel," for the cure of smoky chimneys.

Notwithstanding there appear, in the above list, several mechanical constructions or machines, we beg the public to particularly observe, that the Act under which they have been registered, affords no protection whatever to such inventions.—Ed.

List of Patents

Granted by the French Government from the 1st of April to the 30th of June, 1841.

(Continued from Page 311, Vol. XXIII.)

PATENTS FOR FIVE YEARS.

Morisset, of Paris, for new kind of tomb-stones.

Passadori, of Venice, for new linen.

Passenger, of London, for an apparatus for raising water and other fluids

Peltier, of Paris, for a new mill for plaster.

Pernot de Roussenne, of Bergerac, for an improved reverberating furnace.

Ramelot, of Paris, for an improved table for butchers.

Reumont, of Paris, for a process for rendering impermeable the seams of great coats.

Ringarol, of Paris, for new spectacles.

Salle, of Lyons, for improvements on net-frames.

Sasias, of Paris, for new soap.

Schlossmacker, of Paris, for an improved reservoir for maintaining liquids on a constant level.

Schuster, of Strasbourg, for a new regulator for fire.

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Teissier, of Lyons, for a process for accelerating steam-boats.
Zeiger, of Lyons, for improvements in church organs.
Zola, of Paris, for mechanism for carrying soil.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th November, 1843, to the 17th of December, 1843, inclusive.

To Samuel Wellman Wright, of Wrexham, in the county of Denbigh, North Wales, engineer, for certain improvements in machinery or apparatus for bleaching various fibrous substances; and also for improvements in machinery or apparatus for converting or manufacturing the same into paper.—Sealed 27th November.

James Combe, of Leeds, in the county of York, engineer, for improvements in heckling, cleaning, preparing, and carding flax, and other fibrous substances.—Sealed 28th November.

Nicholas Troughton, of Swansea, in the county of Glamorgan, South Wales, Gent., for improvements in dressing ores requiring washing.—Sealed 29th November.

Arthur Dunn, of Rotherhithe, in the county of Surrey, soap-boiler, for improvements in treating, purifying, and bleaching oils and fatty matters, and in making soap.—Sealed 6th December.

George Edmund Donisthorpe, of Bradford, in the county of York, top-manufacturer, for improvements in combing and drawing wool and certain descriptions of hair.—Sealed 13th December.

List of Patents

Granted for SCOTLAND, subsequent to November 22nd, 1843.

To Matthew Leach, of Manchester, mechanic, for certain improvements in rotatory steam-engines, which improvements are applicable to pumps, for lifting and forcing water.—Sealed 23rd November.

Charles Tetley, of Bradford, stuff merchant, for improvements in the construction of boilers, part of which improvements is applicable for regulating the supply of water and other liquids.—Sealed 23rd November.

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William Prosser, Jun., of Shaftsbury-terrace, Pimlico, for improvements in the construction of roads, and in carriages to run thereon.—Sealed 23rd November.

Charles Brown, of Woolwich, surgeon dentist, for improvements in the manufacture of dip candles.—Sealed 23rd November.

John Kibble, of Glasgow, for improvements in apparatus for propelling vessels.—Sealed 24th November.

Charles Brook, of Mellham Mills, cotton spinner, for certain improvements in machinery for spinning and twisting cotton and other fibrous substances.—Sealed 24th November.

John Withers, of Smethwick, manufacturing manager, for an improvement or improvements in the manufacture of glass.—Sealed 24th November.

Henry Austin, of 87, Hatton Garden, London, civil engineer, for improvements in wood pavements, floorings, and veneers.—Sealed 27th November.

William Bush, of Union-street, Deptford, engineer, for improvements in rendering magnetic needles less prejudicially influenced by local attraction.—Sealed 28th November.

Henry Richardson Fanshawe the Younger, late of Fourville le Pont, France, but now of Wild's Rents, Bermondsey, Surrey, chemist, for improvements in curing hides and skins, and in tanning, washing, and cleansing hides, skins, and other matters.—Sealed 28th November.

Arthur Wall, of Bisterne-place, Poplar, London, surgeon, for improvements in the manufacture of iron.—Sealed 28th November.

John George Bodmer, of Manchester, engineer, for certain improvements in grates, furnaces, and boilers; and also in the manufacturing of iron or other metals.—Sealed 29th November.

Thomas Drayton, of Brighton, for improvements in coating glass with silver, for looking-glasses and other uses.—Sealed 4th December.

Francis Higginson, of Rochester, Lieut. Royal Navy, for certain improvements in fastenings for parts of ships and other vessels; which improvements are also applicable to other building purposes.—Sealed 14th December.

John Hick, of Bolton-le-Moors, engineer, for certain improvements in steam-engines, and in apparatus to be connected therewith, for driving machinery; part of which improvements are applicable to forcing, lifting, and measuring water.—Sealed 15th December.

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Lawrence Hardman, of Liverpool, merchant, for certain improvements in machinery or apparatus to be employed in the manufacture of sugar.—Sealed 18th December.

New Patents
SEALED IN ENGLAND.
1843.

To James Cooper, of St. John-street, Clerkenwell, provision merchant, for vessels of peculiar construction, and an apparatus for the purpose of preserving various articles of provision for the use of families. Sealed 5th December—2 months for inrolment.

John Hick, of Bolton-le-Moors, in the county of Lancaster, engineer, for certain improvements in steam-engines, and in apparatus to be connected therewith for driving machinery, part of which improvements are applicable to forcing, lifting, and measuring water. Sealed 5th December—6 months for inrolment.

Joseph Robinson, of Old Jewry, in the city of London, solicitor, for certain improvements in the construction and mode of working engines, by the agency of air or gases, for obtaining or producing motive power,—being a communication. Sealed 5th December—6 months for inrolment.

William Wardroper, of Welbeck-street, in the county of Middlesex, surgeon, for certain improvements in the forms or constructions of hooks and eyes for fastening dresses, and for other uses. Sealed 5th December—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, Middlesex, civil engineer, for improvements in extracting certain metals from ores and other compounds of these metals, some part or parts of which improvements are also applicable to obtaining another product, or other products, from such ores or compounds,—being a communication. Sealed 5th December—6 months for inrolment.

Lawrence Holker Potts, of Greenwich, Doctor of Medicine, for certain improvements in the construction of piers, embankments, breakwaters, and other similar structures. Sealed 5th December—6 months for inrolment.

John Reed Hill, of 98, Chancery-lane, Middlesex, civil engineer,

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for improvements in a press or presses, machine or machines, for letter-press printing. Sealed 8th December—6 months for inrolment.

William Brockedon, of Devonshire-street, Queen-square, Middlesex, Gent., for improvements in the manufacture of pills and medicated lozenges, and in preparing or treating black lead. Sealed 8th December—6 months for inrolment.

Joseph Lamb, of Manchester, spindle and fly manufacturer, for a certain improvement or improvements in machinery used for preparing and spinning cotton, wool, flax, silk, and similar fibrous materials. Sealed 8th December—6 months for inrolment.

John Bishop, of Poland-street, Westminster, jeweller, for improvements in paving roads, streets, and other places. Sealed 8th December—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, Surrey, Gent., for improvements in apparatus for facilitating the cutting or shaping of materials for making gloves and other articles. Sealed 8th December—6 months for inrolment.

William Baddeley, of Lombard-street, city of London, civil engineer, for certain improvements in rotary engines,—being a communication. Sealed 8th December—6 months for inrolment.

Julius Schottlaender, of St. Swithin's-lane, city of London, merchant, for certain improvements in the deposition of metals upon various felted and other fabrics. Sealed 8th December —6 months for inrolment.

Alexander Southwood Stocker, of Birmingham, wine-merchant, for improvements in the manufacture of glass and other vessels, whereby the corks for the same are easily applied and more effectually retained in their situation where effervescing liquids are used; also in the manufacture of articles, and the application of the same, to that part of the vessels in which his improvements consist, so as to secure the cork; also an apparatus for extracting such corks when required to be released. Sealed 8th December—6 months for inrolment.

Henry Vingoe and William Henry Vingoe, of the town of Penzance, in the county of Cornwall, builders, for improvements in apparatus for planting or setting, drilling or dibbling, corn, grain, seed, pulse, or manure; parts of which improvements are also applicable to the construction of wheels and carriages. Sealed 8th December—6 months for inrolment.

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Alfred Vincent Newton, of the Office of Patents, Chancery-lane, mechanical draughtsman, for improvements in the manufacture of cyanogen and its compounds, particularly the prussiates of potash and soda,—being a communication. Sealed 13th December—6 months for inrolment.

John Sylvester, of Great Russell-street, engineer, for improvements in applying heat to brine or other matters contained in vessels. Sealed 13th December—6 months for inrolment.

Henry Purser Vaile, of Blackfriars-road, Surrey, Gent., for improvements in manufacturing metal, combined with other matters, for the covering of floors and other surfaces. Sealed 13th December—6 months for inrolment.

Robert Kirby, of Cambridge-terrace, Hyde Park, Middlesex, Esq., for certain improvements in materials for and in the modes of applying coverings to coffins for the dead. Sealed 13th December—6 months for inrolment.

William Young, of Queen-street, Cheapside, lamp maker, for improvements in the manufacture of lamps and gas-burners. Sealed 14th December—6 months for inrolment.

Samuel Parlby, of Rutland-gate, Knightsbridge, retired Major of the Bengal Artillery, for improvements in the construction of wheels for carriages. Sealed 18th December—6 months for inrolment.

Benjamin Cook, Jun., of Birmingham, merchant, for certain improvements in coating or covering the surfaces of metals of various forms, and of applying the same to a variety of useful purposes. Sealed 18th December—6 months for inrolment.

Francis L'Estrange, of Dawson-street, Dublin, surgeon, for improvements in hernial trusses, to prevent the descent of hernia through the internal, as well as the external, ring. Sealed 21st December—6 months for inrolment.

Pierre Frederick Ingold, of Dean-street, Soho, watch-maker, for improvements in machinery for making parts of watches and other time-keepers, as well as parts of instruments for mathematical, optical, astronomical, nautical, and musical purposes. Sealed 21st December—6 months for inrolment.

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CELESTIAL PHENOMENA FOR JANUARY, 1844.

D.	H.	M.	
1			Clock before the sun, 3m. 35s.
	—		☽ rises 0h. 44m. A.
	—		☽ passes mer. 8h. 53m. A.
	—		☽ sets 4h. 5m. M.
2			Occul τ in Tauri, im. 11h. 9m. em. 12h. 27m.
	21	49	☿ in conj. with ♄ diff. of dec. 1. 52. N.
	22	17	☽ in Perigee
5			Clock before the sun, 5m. 26s.
	—		☽ rises 4h. 10m. A.
	—		☽ passes mer. Morn.
	—		☽ sets 7h. 41m. M.
	5	34	Ecliptic oppo. or ○ full moon
8	13	2	☿ greatest Hel. Lat. S.
	—		Occul *C* Sextantis, im. 14h. 23m. em. 15h. 12m.
9			Occul *u* Leonis, im. 12h. 39m. em. 13h. 49m.
10			Clock before the sun, 7m. 36s.
	—		☽ rises 10h. 29m. A.
	—		☽ passes mer. 3h. 36m. M.
	—		☽ sets 9h. 47m. M.
	—		Occul *B* Virginius, im. 15h. 18m. em. 16h. 21m.
12	6	27	♃'s second satt. will em.
12	9	31	☽ in □ or last quarter
12			Occul 75 Virginius, im. 13h. 20m. em. 13h. 28m.
	—		Occul 83 Virginius, im. 19h. 5m. em. 19h. 56m.
13	9	25	☿ greatest elong. 18. 52. E.
15			Clock before the sun, 9m. 31s.
	—		☽ rises 3h. 49m. M.
	—		☽ passes mer. 7h. 59m. M.
	—		☽ sets 0h. 3m. A.
	1		☽ in Perigee
	13	15	☿ in the ascending node
16	4	31	♃'s first satt. will em.
17			Mercury R. A. 21h. 8m. dec. 16. 5. S.
	—		Venus R. A. 21h. 41m. dec. 15. 35. S.
	—		Mars R. A. 23h. 46m. dec. 1. 57. S.
	—		Vesta R. A. 17h. 11m. dec. 19. 24. S.
	—		Juno R. A. 23h. 13m. dec. 8. 11. S.
	—		Pallas R. A. 15h. 23m. dec. 1. 30. N.
	—		Ceres R. A. 15h. 25m. dec. 11. 14. S.
	—		Jupiter R. A. 22h 10m. dec. 12. 20. S.
	—		Saturn R. A. 20h. 0m. dec. 20. 48. S.
	—		Georg. R. A. 23h. 57m. dec. 1. 2. S.
	—		Mercury passes mer. 1h. 23m.
	—		Venus passes mer. 1h. 57m.
	—		Mars passes mer. 4h. 2m.
	—		Jupiter passes mer. 2h. 25m.
	—		Saturn passes mer. 0h. 16m.
18	14	32	♄ in conj. with the ⊙
19	6	18	Ecliptic conj. or ● new moon
19	6	27	♄ in conj. with the ☽ diff. of dec. 3. 22. S.
	15	16	☿ stationery
20			Clock before the sun, 11m. 11s.
	—		☽ rises 8h. 0m. M.
	—		☽ passes mer. 0h. 47m. A.
	—		☽ sets 5h. 44m. A.
	2	52	☿ in Perihelion
	13	6	☿ in conj. with the ☽ diff. of dec. 2. 53. S.
21	11	10	♂ in conj. with ♅ diff. of dec. 0. 23. S.
	15	5	♀ in conj. with the ☽ diff. of dec. 6. 48. S.
	20	28	♃ in conj. with the ☽ diff. of dec. 6. 15. S.
23			Occul *k*1 Piscium, im. 6h. 11m. em. 6h. 36m.
	6	26	♃'s first satt. will em.
24	2	29	♅ in conj. with the ☽ diff. of dec. 6. 20. S.
	6	25	♂ in conj. with the ☽ diff. of dec. 5. 52. S.
	8	48	♀ in conj. with ♃ diff. of dec. 0. 38. S.
25			Clock before the sun, 12m. 31s.
	—		☽ rises 9h. 35m. M.
	—		☽ passes mer. 4h. 31m. A.
	—		☽ sets 11h. 40m. A.
27	4		☽ in Apogee
27	0	31	☽ in □ or first quarter
28			Occul 65 Arietis, im. 7h. 4m. em. 8h. 21m.
29	0	5	☿ in inf. conj. with the ⊙
			Occul *k*1 Tauri, im. 13h. 2m. em. 13h. 11m.
30	10	51	☿ greatest Hel. Lat. N.
31			Occul Q^2 Tauri, im. 5h. 58m. em. 7h. 12m.

J. LEWTHWAITE, Rotherhithe.

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Granthams imp.d arrangements of marine engines.

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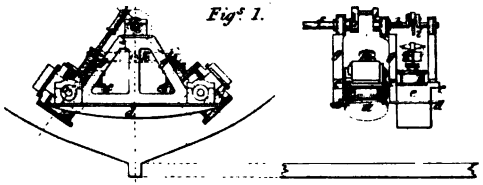


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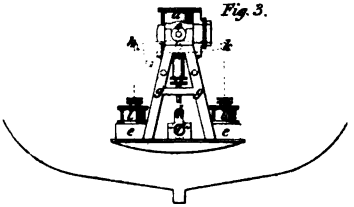


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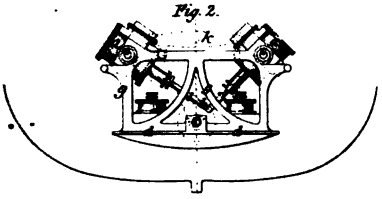


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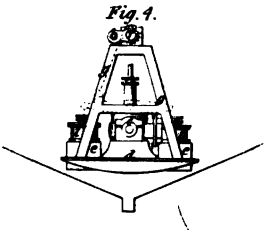
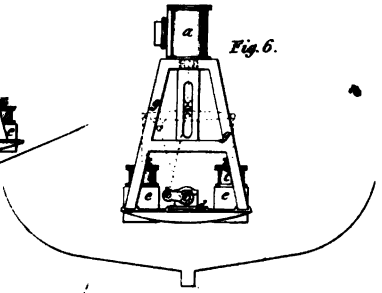


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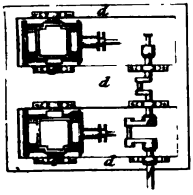


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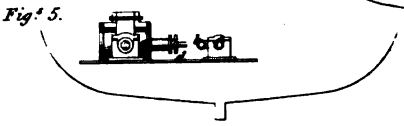


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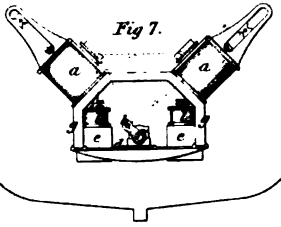


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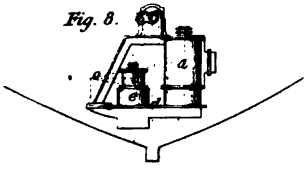


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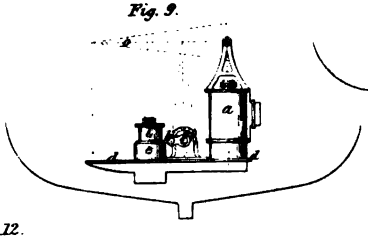


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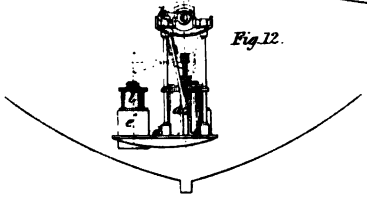


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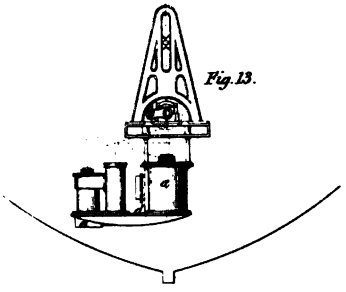


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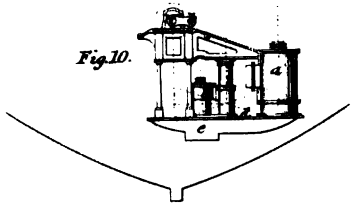


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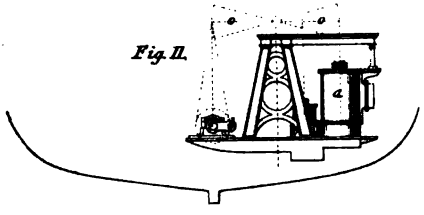
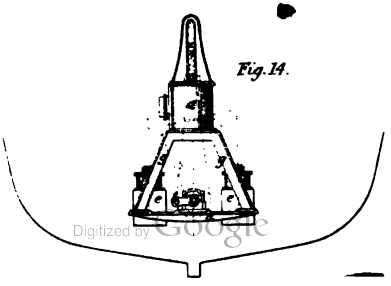


Fig. 14.



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York's imp.d axles for railway wheels.

Fig. 1.

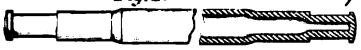


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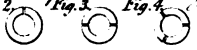


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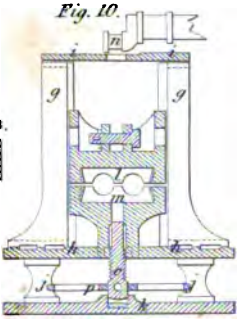


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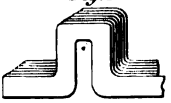


Fig. 5.



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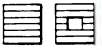


Fig. 14.



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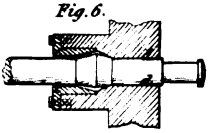


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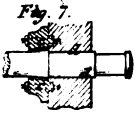


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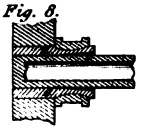


Fig. 9.



Morris's imp.ts in steam engines.

Fig. 1.

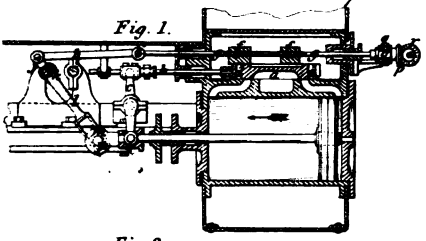


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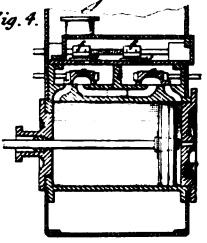


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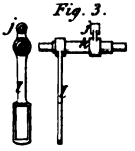
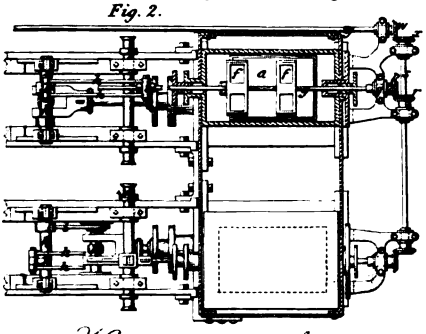
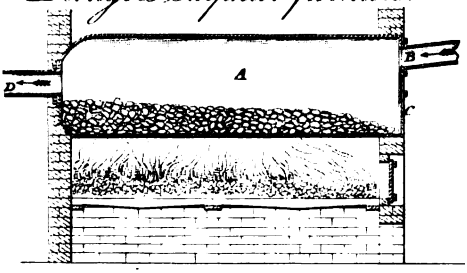


Fig. 2.



Rodgers' sulphur furnace.



Kneller's App.ts for manufacturing soda.

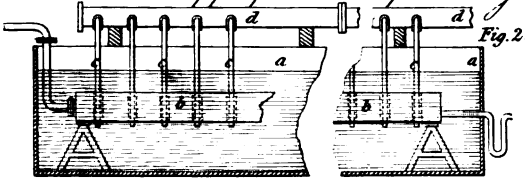
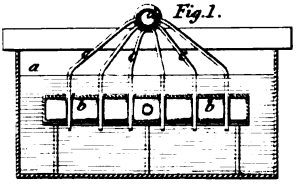


Fig. 1.



Young's App.ts for manufacturing ammonia.

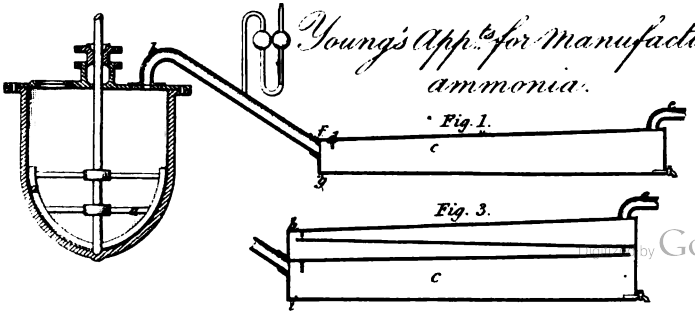
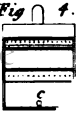


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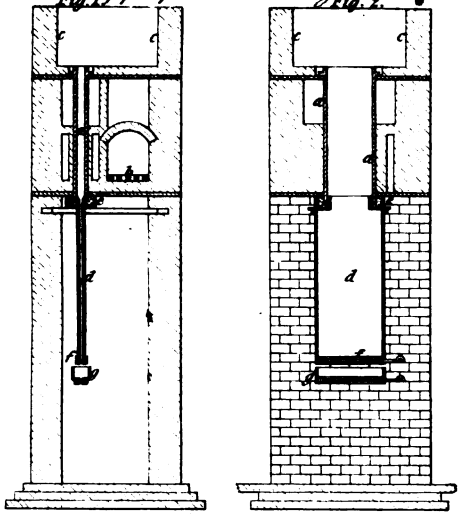
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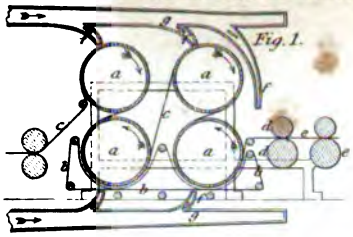
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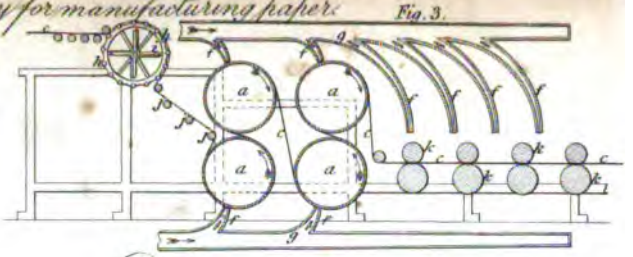
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Parkers appt.d for reburning charcoal.

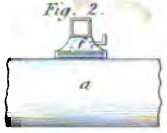


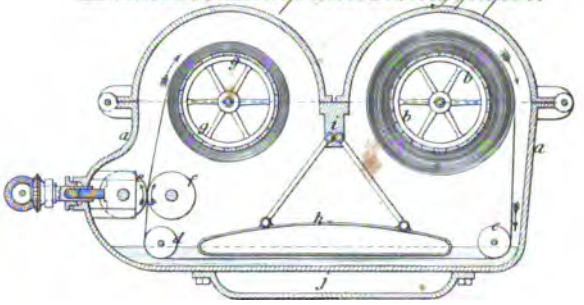
Barratt's machinery for manufacturing paper.





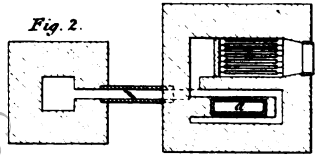
Dickinson's impt.d in sizing paper.



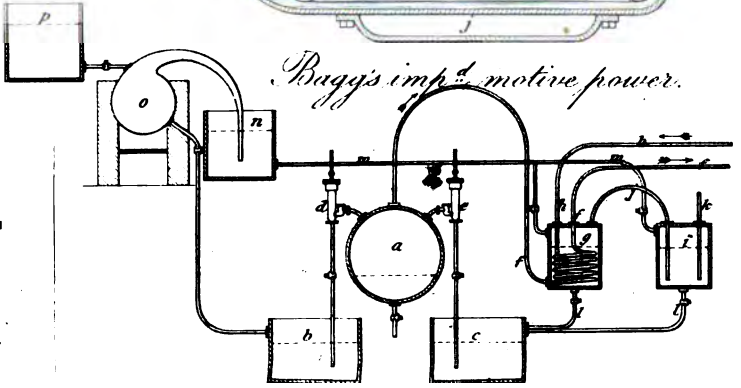


Rymer's castor.

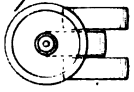


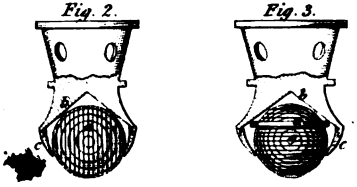


Bagg's impt.d motive power.



Pape's castor.





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Palmer's impt in the construction of roofs & parts of buildgs

Fig. 1.

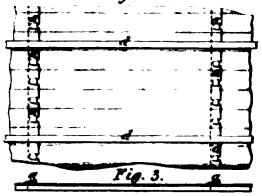


Fig. 3.

Fig. 2



Fig. 4.

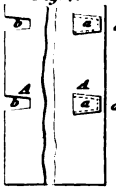


Fig. 5.



Fig. 7.

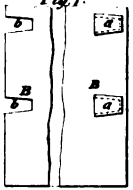


Fig. 6.

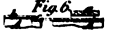


Fig. 8.



Fig. 26.

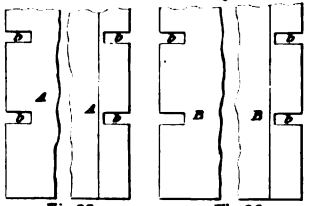


Fig. 28.

Fig. 9.

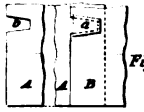


Fig. 11.



Fig. 14.



Fig. 10.



Fig. 12.



Fig. 13.



Fig. 27.



Fig. 29.



Fig. 33.



Fig. 21.

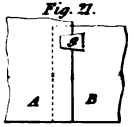


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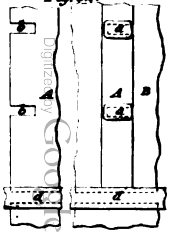


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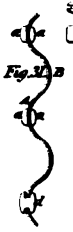


Fig. 30.



Fig. 15.



Fig. 16.



Fig. 18.



Fig. 19.



Fig. 17.



Fig. 22.

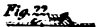


Fig. 20.



Fig. 34.



Fig. 35.



Fig. 23.



Fig. 24.



Fig. 38.



Fig. 36.

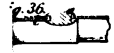


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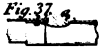


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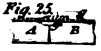


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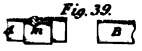


Fig. 40.



Fig. 41.

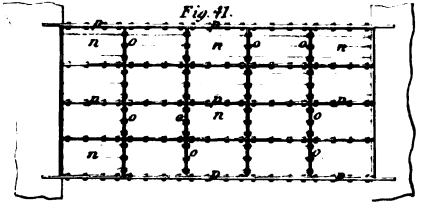


Fig. 42.

Fig. 43.

Varley's impt in steam engines.

Fig. 1.

Fig. 2.

Stewart's impt Castor.

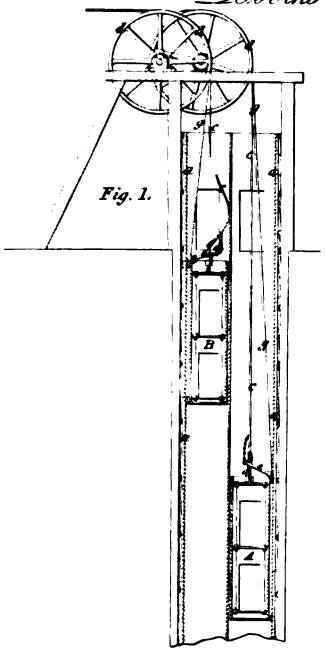
Fig. 3.

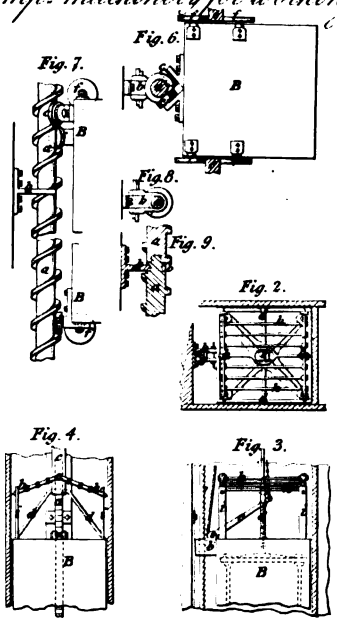
Fig. 1.

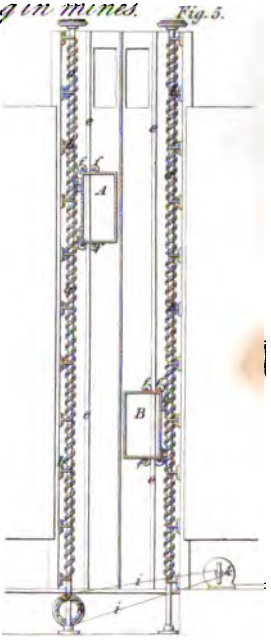
Fig. 2.

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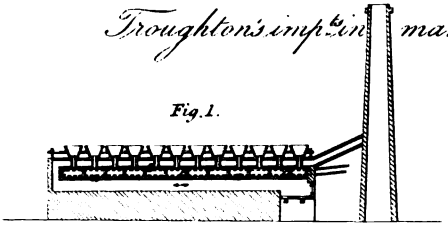
Booth's imp.d machinery for working in mines.

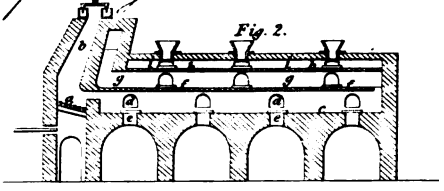


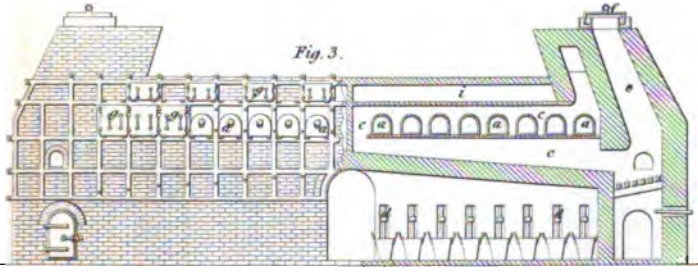


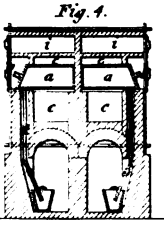


Troughton's imp.t in manufacturing zinc.

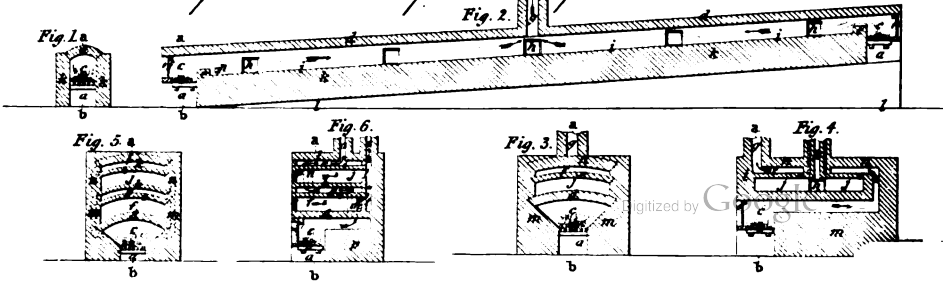








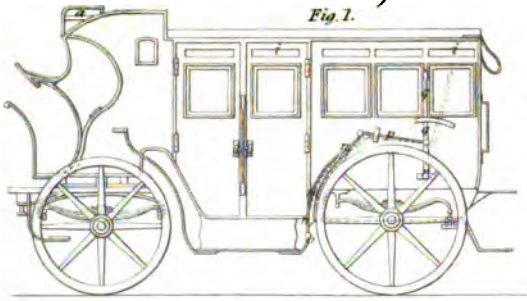
Hunt's imp.t in the manufacture of soda.

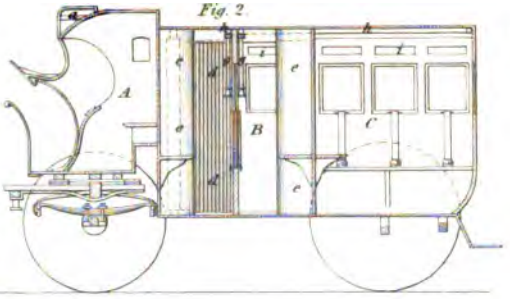


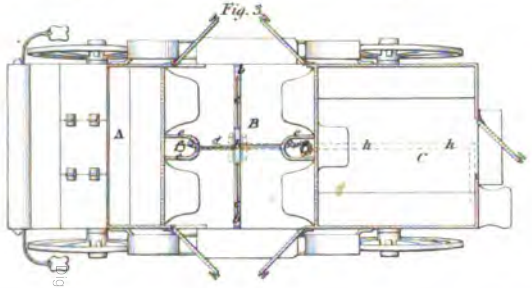
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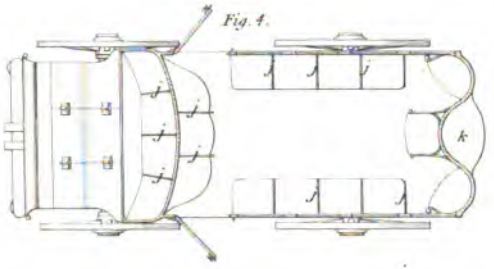
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Warburton's impt. in omnibuses.

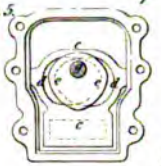

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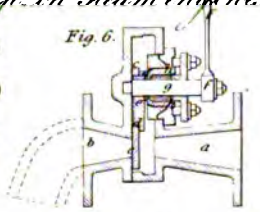

Fig. 2.

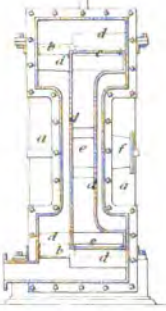

Fig. 3.

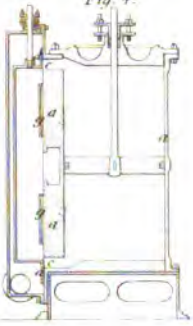

Fig. 4.

Woodcock's impt. in steam engines.

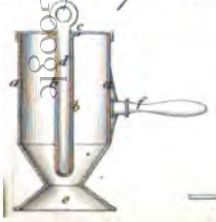

Fig. 5.


Fig. 6.


Fig. 3.


Fig. 4.

Chesterman's filter.



Boydell's heel-plates, &c.


Fig. 1.


Fig. 3.


Fig. 2.


Fig. 5.


Fig. 4.

Cards candle wick.


Fig. 2.

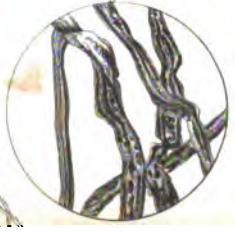
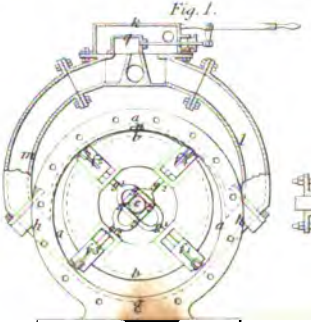
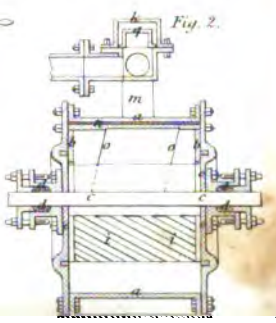

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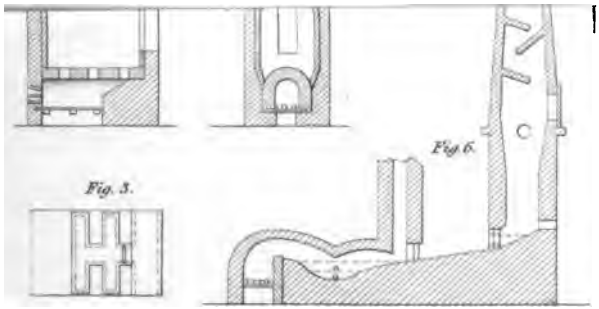

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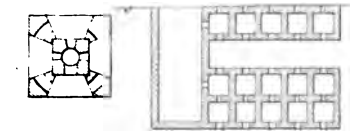

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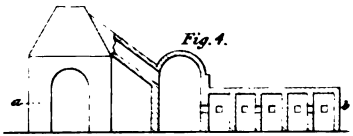

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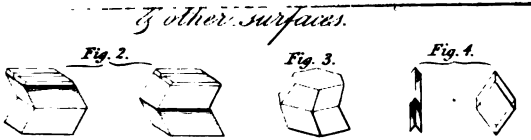
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W. Newton del.

1st Oct.r 1843.

T. Sherratt sc.

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Goos' improvem.ts in the Jacquard app.ts

Fig. 4.

Fig. 2.

Fig. 3

Fig. 1.

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Winsor's imp.d burner

Fig. 2.

Fig. 1.

Templeton & Quigley's imp.ts in weaving

Fig. 1.

Fig. 2

Diagram.

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Jarman, Cook & Wordsworth's imp.t in spinning

Fig. 1.

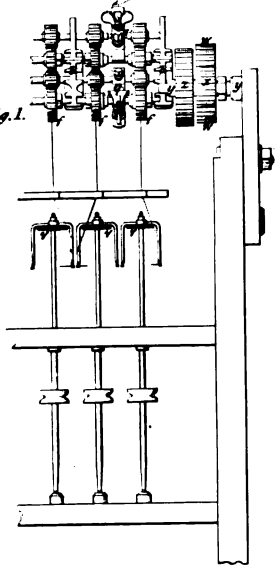
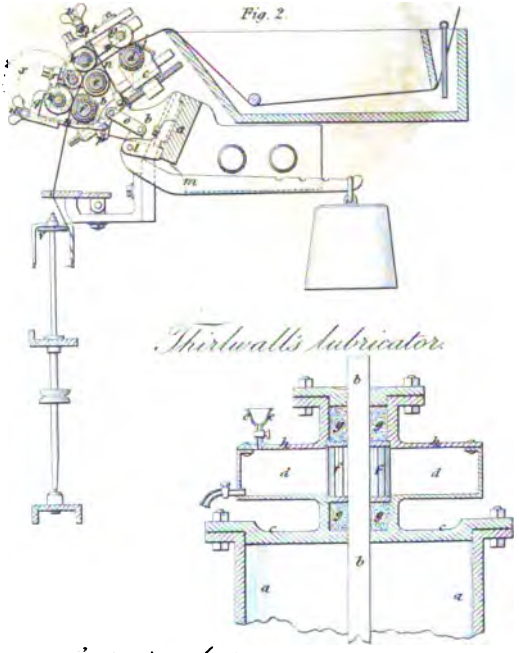


Fig. 2.



Thirlwall's lubricator.

Harris's imp.t in manufacturing buttons.

Fig. 1.

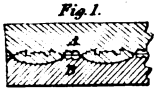


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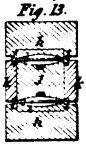


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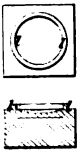


Fig. 15.



Fig. 16.



Fig. 17.



Fig. 2.



Fig. 9.



Fig. 11.



Fig. 12.



Fig. 18.

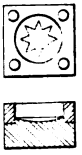


Fig. 3.



Fig. 10.

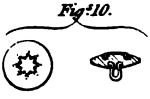


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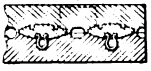


Fig. 4.



Fig. 7.

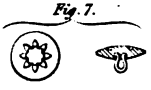


Fig. 5.

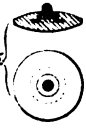


Fig. 8.



Stuckey's imp.t in filtering.

Fig. 1.

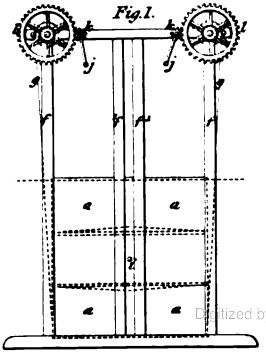


Fig. 3.

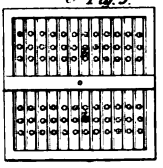
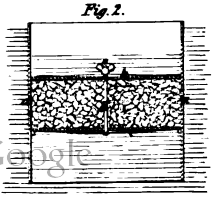


Fig. 2.



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Clyes imp.ts in gas & water meters.

Fig. 1.

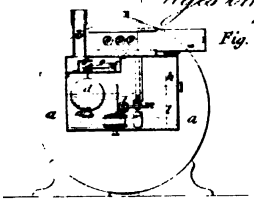


Fig. 2.

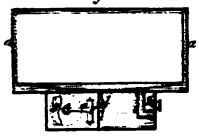


Fig. 5.

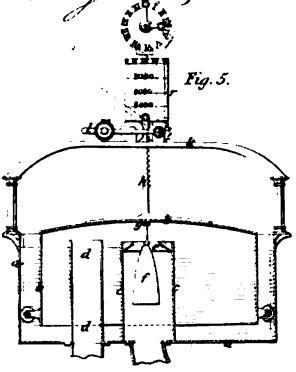
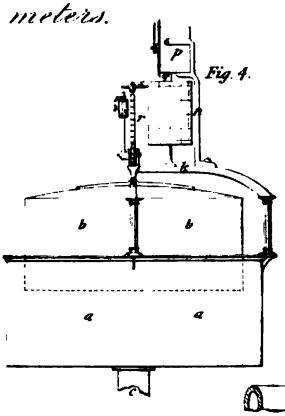


Fig. 4.



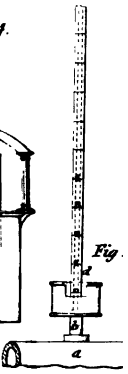


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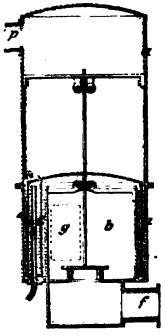


Fig. 3.

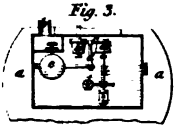


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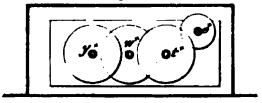
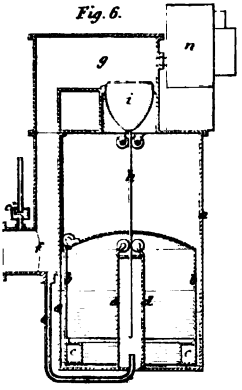


Fig. 17.



Fig. 6.



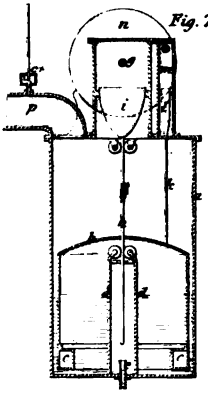


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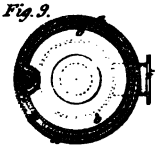


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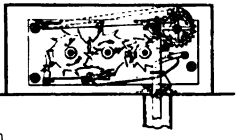


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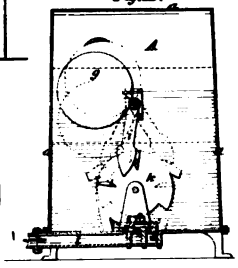


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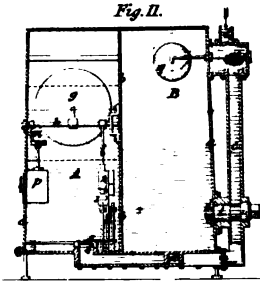
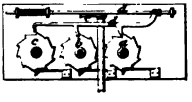


Fig. 18.





Gore's imp.ts in spinning.

Fig. 1.

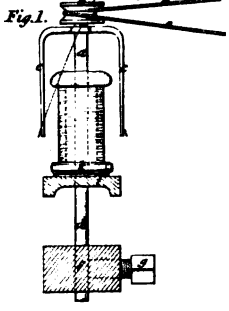


Fig. 2.

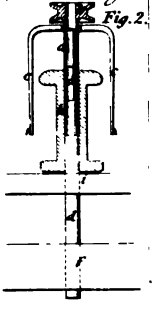


Fig. 14.

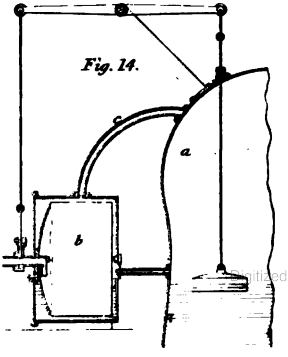
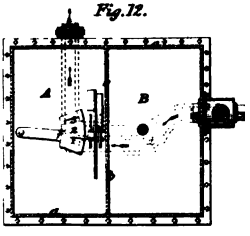


Fig. 12.



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Clarks evaporating & distilling appa.

Fig. 2.

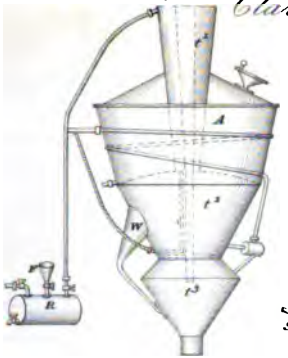


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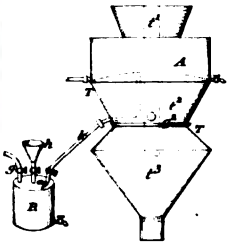
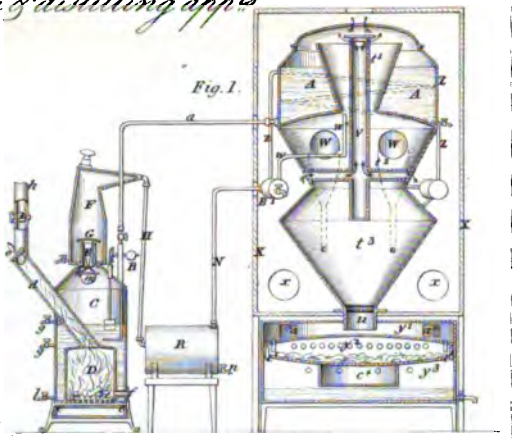


Fig. 1.



Wrigley's mach.y for manufact.g paper.

Fig. 1.

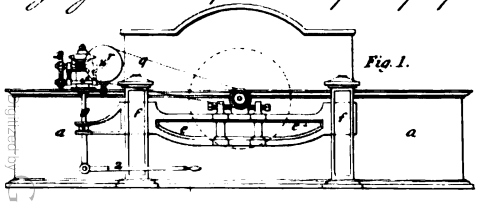


Fig. 2.

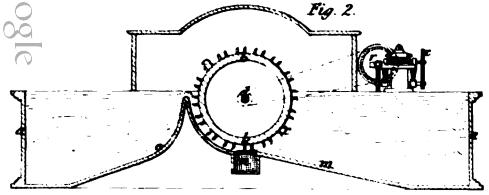


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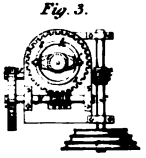
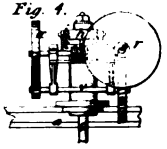


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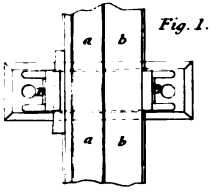


Bailey's imp.d rail.

Fig. 2.



Fig. 1.



Scaly's improved tile

Fig. 1.



Fig. 3.



Fig. 7.



Fig. 2.



Fig. 4.

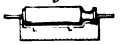


Fig. 5.



Fig. 8.

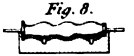


Fig. 6.



Gerishs imp.d fire escapes

Fig. 4.



Fig. 3.

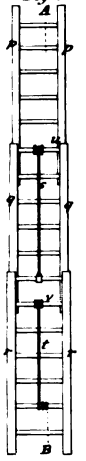


Fig. 1.

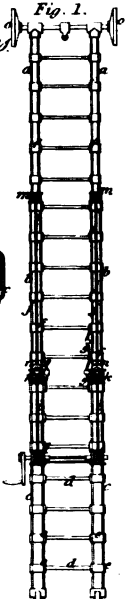


Fig. 2.



Fig. 5



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Wilde's imp.t in railway switches.

Fig. 3.

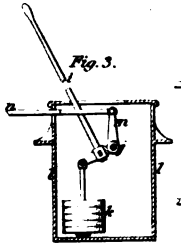


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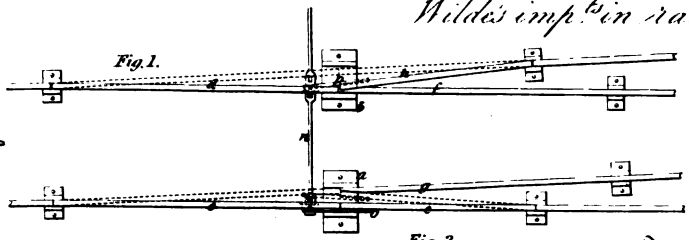


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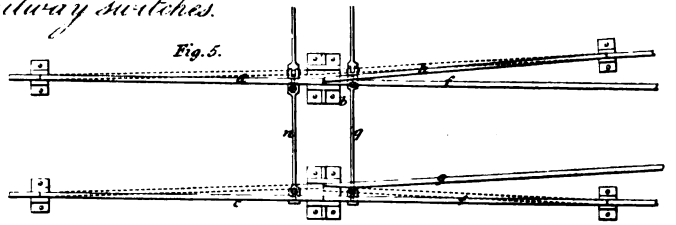


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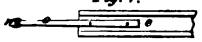


Fig. 2.



Fig. 6.

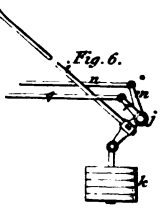


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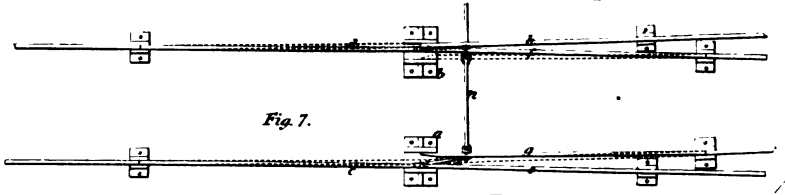
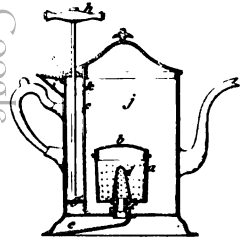


Fig. 8.



Andrews's coffee pot.



Topham's app.s for extinguish.g fires.

Fig. 1.

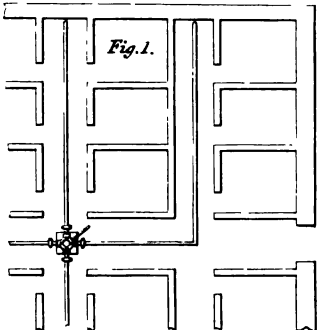
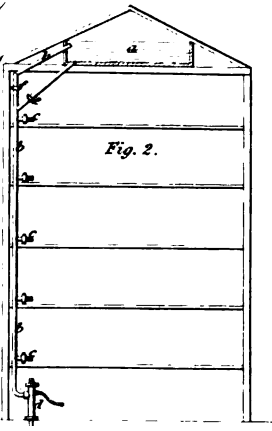


Fig. 2.



Kendall's connections for railw.y trains.

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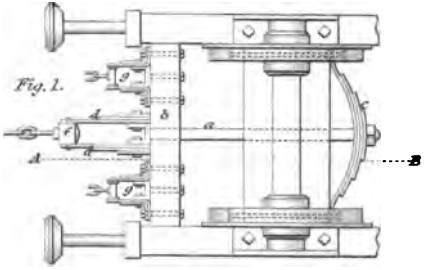


Fig. 2.

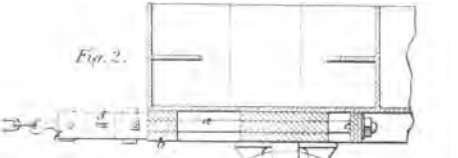


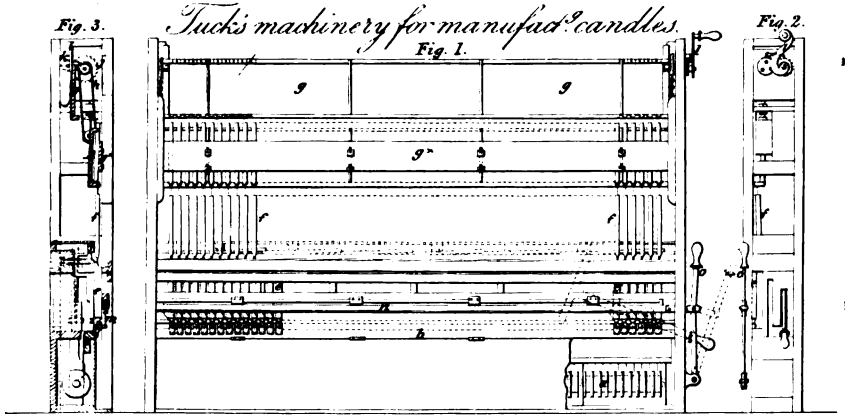
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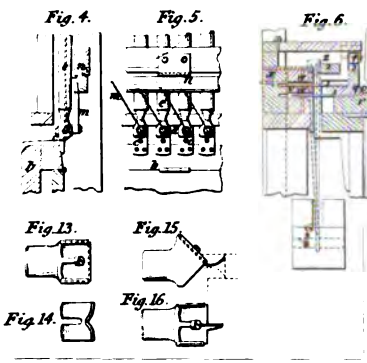


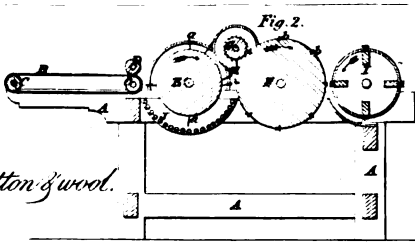
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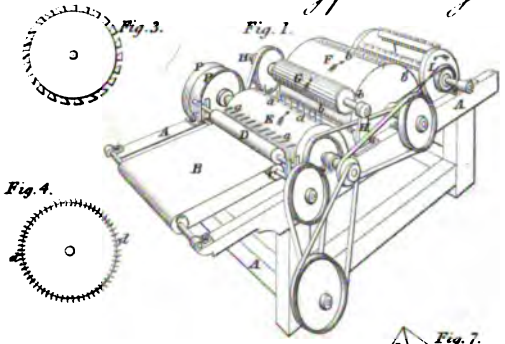
Tuck's machinery for manufact.g candles.

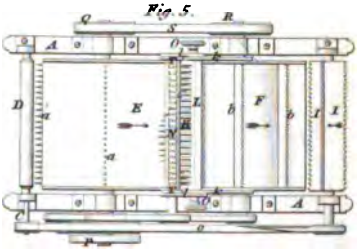




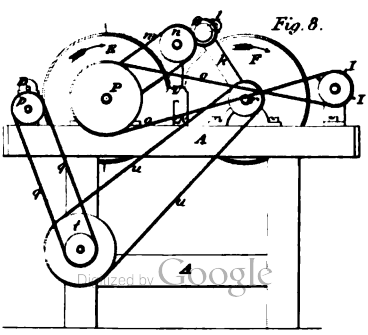


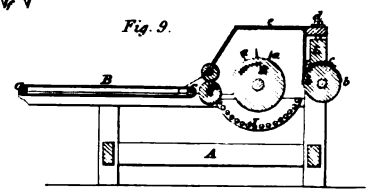
Newton's machinery for cleaning cotton & wool.











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W. Newton del. Dec.r 1st 1843.

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Kirby's brick making machine.

Fig. 2.

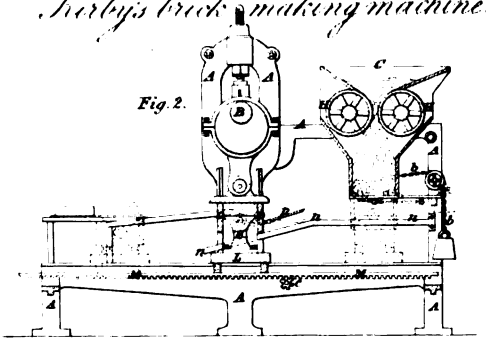


Fig. 1.

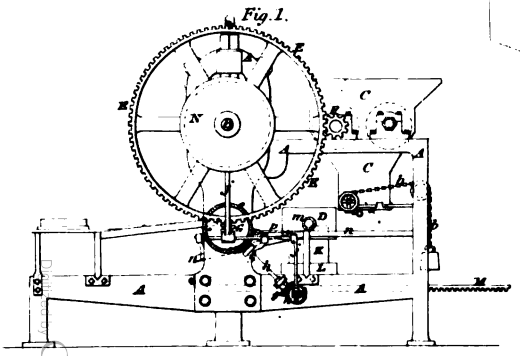
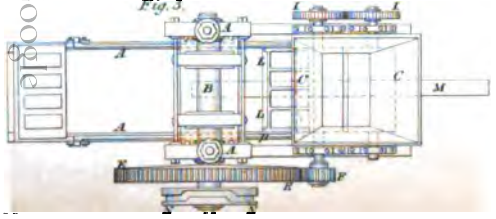


Fig. 3.



Newton's mach.y for manufact.g artificial fuel.

Fig. 1.

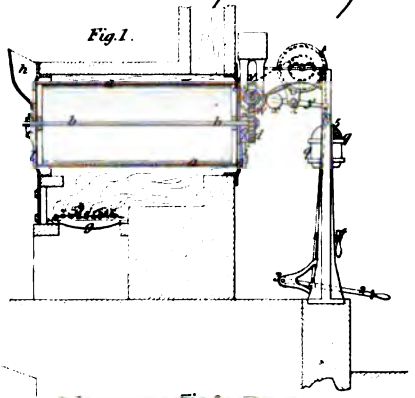


Fig. 3.

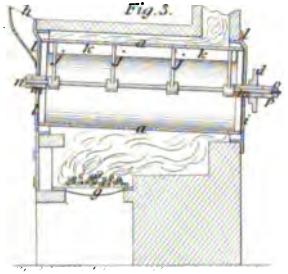


Fig. 4.

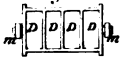


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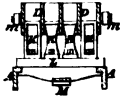


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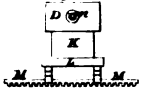
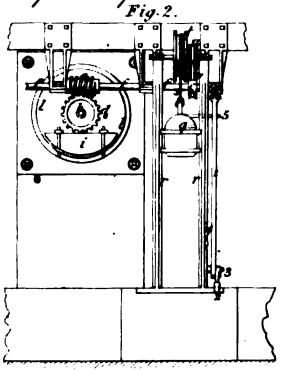


Fig. 2.



Barclay's improvem.ts in chandeliers.

Fig. 1.

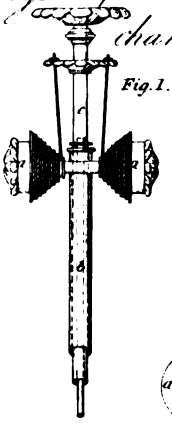
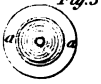


Fig. 2.



Fig. 3.



Smith's imp.ts in gloves.

Fig. 4.

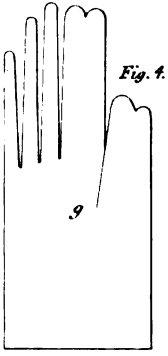


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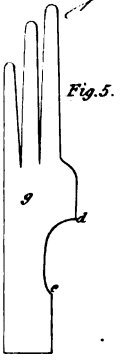


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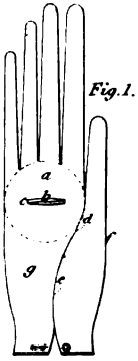


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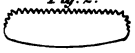


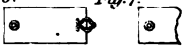
Fig. 3.



Fig. 6.

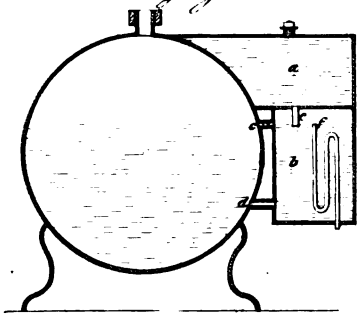


Fig. 7.



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Hemming's gas meter.



Mac Innes' imp.t in funnels.

Fig. 3.

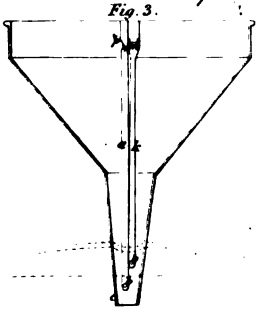


Fig. 4.



Bolten's gas meter.

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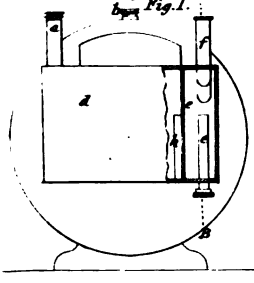


Fig. 2.

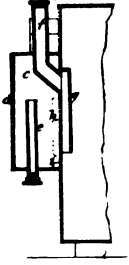


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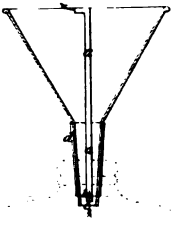
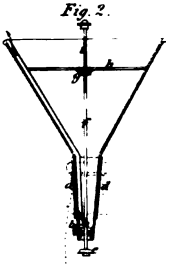


Fig. 2.



Boddy's imp.t in windows & window shutters.

Fig. 3.

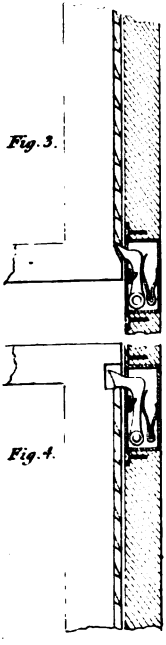


Fig. 4.

Fig. 2.



Fig. 1.



Fig. 5.



Fig. 6.

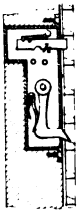


Fig. 7.



Fig. 8.



Cassell's imp.ts in lamps.

Fig. 2.



Fig. 1.

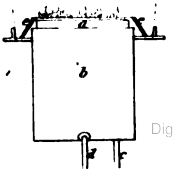
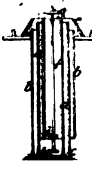


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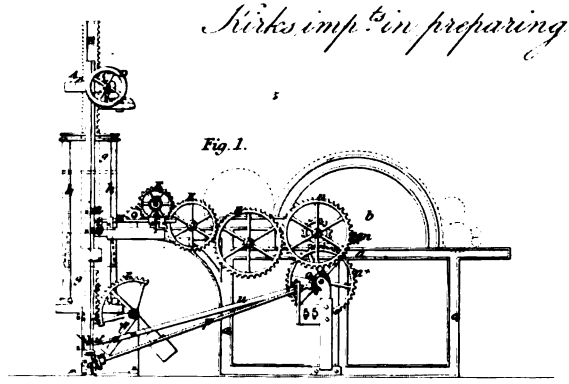
Fig. 3.

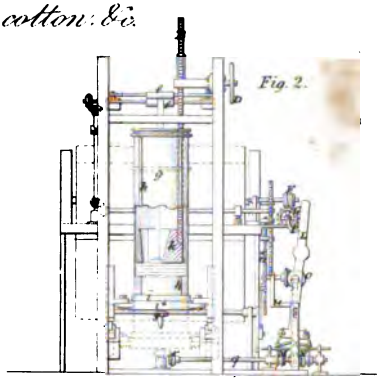


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Kirks imp.ts in preparing cotton &c.


Fig. 1.


Fig. 2.

Pims improved buoy.

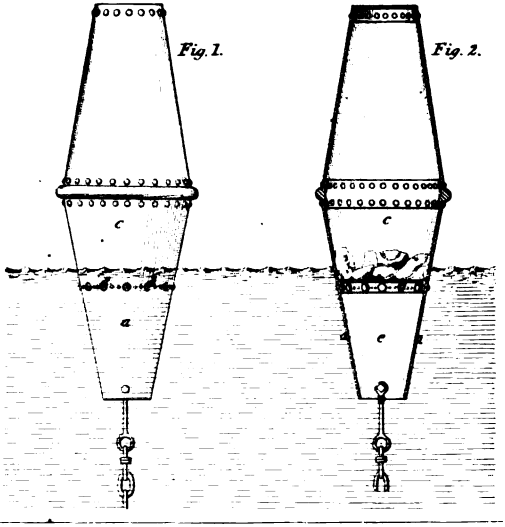

Fig. 1.

Fig. 2.

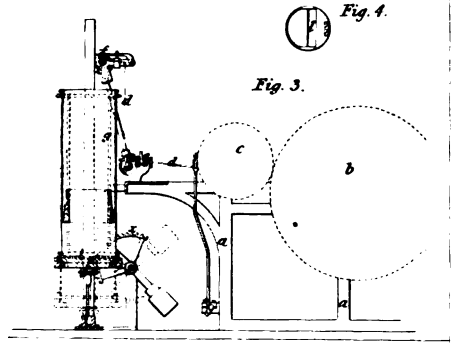
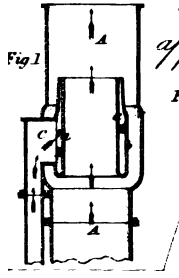

Fig. 4.

Fig. 3.

Tappan's appts applicable to chimneys.


Fig 1

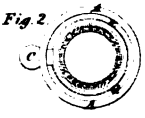
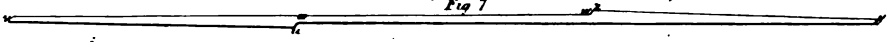
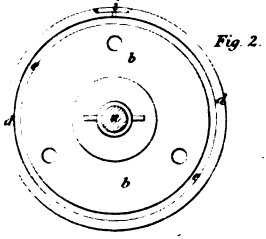
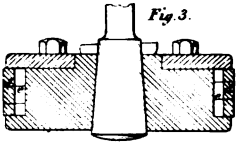

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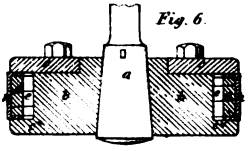
Fig. 3

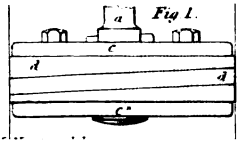
Barkers imp.ts in metallic pistons.

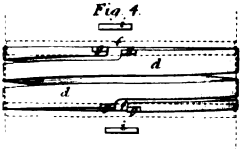

Fig 7

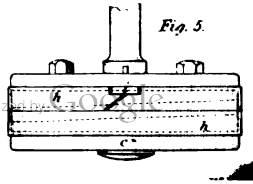

Fig. 2.


Fig. 3.


Fig. 6.


Fig 1.


Fig. 4.


Fig. 5.

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mach.ry for cutting wood

...ces imp.t in cleaning wool.

Fig. 1.

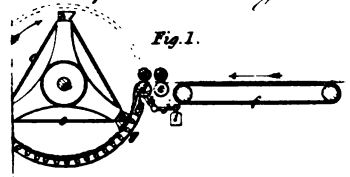
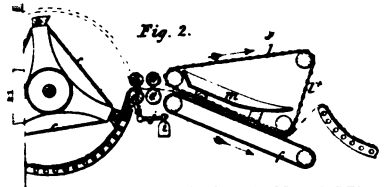


Fig. 2.



...t in drums.

Fig. 6.

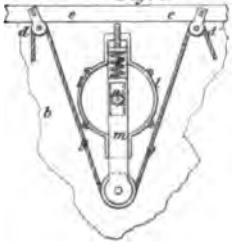


Fig. 7.



Fig. 2.

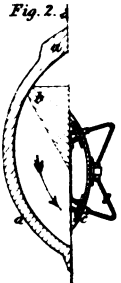
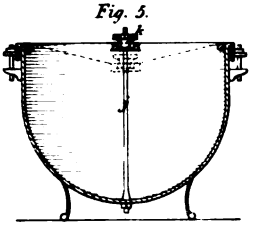


Fig. 5.



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W Newton

T. Sherratt Sc

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Berry's machinery for ruling paper.

Fig. 1.

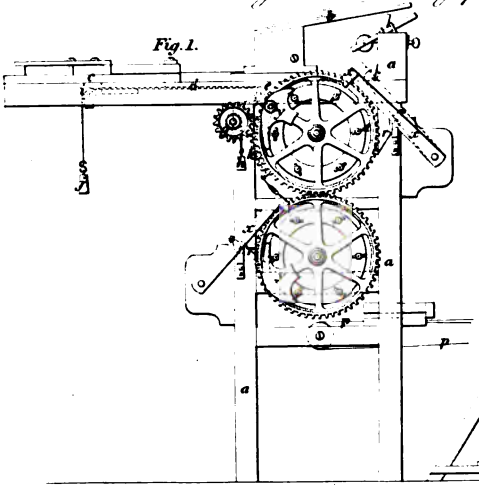


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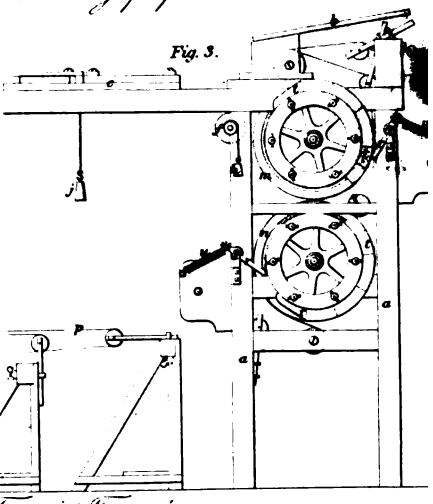
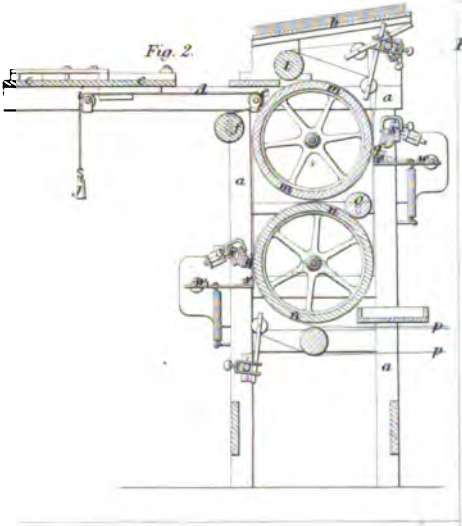


Fig. 2.



Francis & Junges imp.d tile.

Fig. 3.



Fig. 1.



Fig. 4.

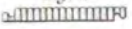
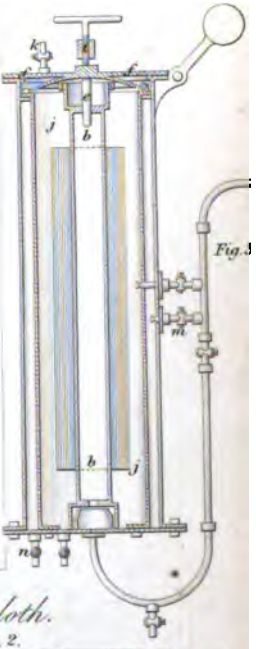


Fig. 2.



Fig. 5.





Mitchell's imp.ts in finishing cloth.

Fig. 7.

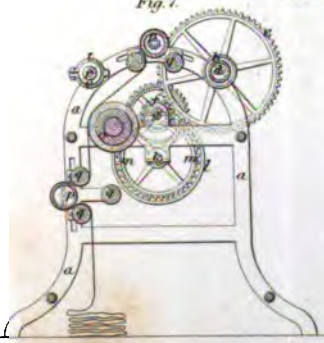
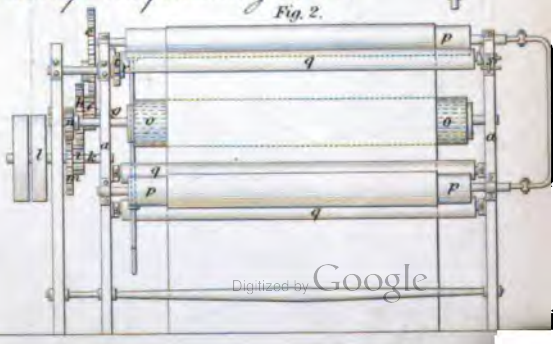


Fig. 2.



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